REASON AND REVELATION

EDWARD McCRADY, D.D.

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AND
REVELATION

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Argument for the Truth of Revealed Religion
Based Solely upon the Evidences of Science
And Philosophy

+

By

EDWARD McCRADY, D. D.,
Professor of Philosophy,
University of Mississippi

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Dedicated

To

My Father

PROF. JOHN McCRADY

(Formerly Assistant Professor of Mathematics, College of Charleston, S. C.; Louis Agassiz's Assistant and Successor, Chair of Zoology, Harvard University; Professor of Biology and Relation of Science to Religion, University of the South;)

Whose unfinished labours in behalf of the harmonization of the truths of Science and Revelation have been a Life-long Inspiration, These pages are affectionately dedicated.

By Scientific Data I do not merely mean the truths of Physical, Mathematical or Logical Science, but those of Moral and Metaphysical Science. For, by Science, I understand all knowledge which rests upon evidence and reasoning of a like character to that which claims our assent to ordinary scientific propositions.

And if any one is able to make good the assertion that his Theology rests upon valid evidence and sound reasoning, then it appears to me that such Theology will take its place as a part of Science.

THOS. H. HUXLEY

PREFACE

FOR many years past, the writer has been engaged in the preparation of a work dealing with the correlation of scientific, philosophical, and religious experiences, which because of the range of the subjects involved, and the limited time at his disposal, has never been brought to completion. From time to time, however, he has given partial expression to his views, in numerous lectures upon some of the more important topics under consideration. These lectures have ranged all the way from matters of general philosophical interest, to more or less technical discussions of psychological, mathematical, and scientific problems, but always with the purpose of throwing some additional light—however little it might be—upon the great "Riddle of the Universe." Due to the most unusual interest manifested by the public in the issue (so called) between Science and Religion, the writer has been especially called upon of late to explain the current theory of Evolution, and to point out its true, though grievously misunderstood relation to the fundamental doctrines of the Christian faith. The following pages embody the substance of some (though not all) of the addresses delivered in response to this demand. But while considerable space has been devoted here to the elucidation of the theory of Evolution as commonly received by the scientific world, it has been more especially the object of the writer to emphasize certain psychological and other aspects of the problem to which little attention has been hitherto devoted, and further to stress the fact that this much discussed process with which the biologist is so deeply concerned, is, after all, only a subordinate phase of a far wider—all comprehensive movement—characterizing the cosmos as a whole. In short, while fully recognizing the fact of Evolution in Nature, the author is at pains to show that it is not (as commonly represented) a single "uninterrupted" process going on without limit, but that the real cosmic development is, in fact, an alternating sequence of *integrations* and *differentiations*, of creations (commonly called emergences) and evolutions, with a definite Goal foreshadowed.

The justification for this position is to be found partly in certain biological phenomena which have ever proved embarrassing for those Evolutionists who deny the possibility of "saltations" or "discontinuities" of any kind; partly again in certain similar psychological phenomena which bespeak a like discontinuity in the Evolution of Mind (and which, we may add, are significantly coincident with the corresponding biological phenomena), but most of all in the mathematical evidence for admitting the reality of diverse "regions" or "orders" of existence in Nature, with its corollary that the "laws" and "processes" characteristic of any one of these spheres are "interrupted" (literally break down) when they reach the "limit" or boundary of that region, and are superseded by the "emergence" (creation) of a "new synthesis", whose actualizations are expressed in new laws and processes peculiar to this latter region. In short, the writer contends that the operation of the principle of the *variable and its limit,* though curiously overlooked, is exhibited everywhere in Nature —is the key to the phenomena of "emergences", and the standing proof of the "miraculous" in the very midst of natural processes. It is only necessary to examine this principle of the variable and its limit in the light of that solution of the enigma which the philosophy of mathematics has itself furnished, to be satisfied that this last statement is not a dream of the imagination, but the result of the soberest mathematical reasoning. We may add that the very latest results of physico-mathematical speculation, especially as emphasized in the theory of Einstein, fully substantiates this opinion.*

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*"The great power possessed by the general principle of Relativity lies in the *comprehensive limitation* (italics ours,) which is imposed on the Laws of Nature." (Einstein, *Relativity—The Special and General Theory,* p. 118). In short the old attitude of Science toward the invariance of "The Laws of Nature," no longer holds. It is now known that these Laws are "invariant" only under certain conditions and within certain "limits". The literature of recent physico-mathematical research is full of evidence to this effect. The particular processes of nature, and the laws which govern them, are constant only within certain "limits". The process known as Evolution, together with its characteristic law—"The Law of Evolution," is no exception to the rule.

In carrying out his work the writer is conscious of many repetitions, and is well aware that he will probably be charged with being too prolix in the discussion of details which to the average reader may appear superfluous. His defense is that the book is a study—not a diversion; and that in the attempt to establish propositions scientifically, and simultaneously to satisfy the objections of scepticism, one must safeguard every step in the argument by adequate evidence and demonstration, and this will necessarily be irksome to those who read for entertainment rather than for the acquisition of sound, philosophical truth. There is no royal road to the discovery of truth in matters of this kind, and one must oftentimes sacrifice diction to evidence and demonstration. Seeking justification in the shadow of a great name, the writer would cite the words of Einstein, offered in anticipation of a similar complaint:—"In the interest of clearness, it appeared to me inevitable that I should repeat myself frequently, without paying the slightest attention to the elegance of the presentation. I adhered scrupulously to the precept of that brilliant theoretical physicist, L. Boltzmann, according to whom matters of elegance ought to be left to the tailor and to the cobbler."

It may be added that the real argument begins only with the third chapter—"The Philosophy of Evolution." The first two chapters are of an introductory character, and deal largely with historical and other preliminary considerations, necessary to a real appreciation of what is to follow.

The author desires to acknowledge his indebtedness to his father, Prof. John McCrady, for the idea of applying certain mathematical principles to the problems of Development. The thought of employing the higher mathematics to elucidate such matters—especially of employing the principle of the Variable and its Limit to explain many difficult problems associated with theory of Evolution—originated with him. Unfortunately, his untimely death, and the destruction of the greater part of his manuscripts, have made his own precise views difficult to ascertain. While, therefore, the general idea involved in this principle is entirely due to Prof. John McCrady, its specific application, as here set forth, is the author's own work, for which he, and he alone, must be held responsible. The principle itself is undoubtedly valid, however the writer may have blundered in expounding it.

In conclusion, the author further desires to express his obligations to his life-long friends, the Rt. Rev. Theodore D. Bratton, D. D., Bishop of Mississippi; and Prof. W. H. DuBose, D. D., of the University of the South, for many years of constant encouragement and advice, as well as for substantial assistance in the undertaking; to his son, Dr. Edward McCrady, Jr., Fellow of Wistar Institute of Anatomy, Philadelphia, for important suggestions and services rendered; to his colleague Dr. W. C. Morse, State Geologist, and Head of the Department of Geology, University of Mississippi, whose generosity and encouragement have especially facilitated the publication; and finally, to the many students and other friends whose sustained interest in the undertaking, over a long period of time, has proved a veritable inspiration.

E. McC.

Oxford, Mississippi.
July 9, 1935.

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Part I

CHRISTIANITY AND COSMIC DEVELOPMENT

The author fully recognizes the fact of Evolution in Nature, but contends that the particular process with which the biologist is especially concerned has its limits; that it is, in fact, only a subordinate phase of a far greater, world-wide movement in which both Creation and Evolution have a rational place. That cosmic development is, in fact, an alternation of integrations *and* differentiations, *of creations and evolutions with a definite Goal foreshadowed. The principle of the* Variable and its Limit *is shown to be operative everywhere in Nature—the key to the phenomena of "emergences", and the proof of the "miraculous" in the very midst of natural processes.*

INTRODUCTION

BEFORE it is possible for us to enter into any intelligent discussion of the bearing of the theory of Evolution upon the fundamental problems of Philosophy and Religion, it is very necessary that we clearly understand just what the theory itself really is. This, however, is by no means an easy matter to expound, as there has never been any one universally accepted definition of the term even among scientists themselves, and the real significance of the theory only gradually emerges after considerable study of the various expositions of the subject which have been made from time to time. It is further necessary—so far as the general public is concerned—to remove the erroneous impression that the words "Evolution" and "Darwinism" are synonymous terms. This is far from true. Darwinism is only one of many interpretations of the theory, and though one which, for a long time, was the most commonly accepted interpretation, has now, for several decades, been under fire, and is even regarded as obsolete by many distinguished authorities. It is very important to stress this point, as much of the prejudice of Christian people toward the whole subject is based primarily upon certain implications of the interpretations of Darwin and Haeckel, and have no bearing whatever upon a number of other equally as authoritative expositions of the matter.

In short, we shall have to realize that there are as many different interpretations of the theory of descent amongst Evolutionists themselves, as there are different interpretations of Christianity amongst professing Christians. Just as the various denominations of Christendom, while a unit as regards the more or less essential doctrines of the Faith, are nevertheless widely at variance regarding many lesser though more or less important matters, so practically all scientists to-day accept the theory of Evolution in some sense, while differing profoundly among themselves as to the precise details of the process. All Evolutionists therefore, are not Darwinians, any more than all are followers of Haeckel or of Weismann, of DeVries or of Nägeli, of Driesch or of Bateson. We must not condemn the whole subject of Evolution, then, merely because as Christian people, we may have reason to differ, and differ profoundly, with some one or more of these many expositions of the subject. That some of these interpretations are undoubtedly anti-Christian in tendency, and even, in some instances, absolutely irreconcilable with the fundamentals of the Christian religion, is true; but that all are thus incompatible with the Faith, is not true. On the contrary, there is no more grievous error than to suppose that such is the case. As we propose to show in the following pages, not only are there certain interpretations which are compatible with Christianity, but some which are most helpful and instructive to the theologian because of the unexpected light they shed upon many otherwise obscure matters of Revelation.

To suppose, indeed, that any and every interpretation of the theory is necessarily at variance with the Christian faith, would be to cast the stigma of ignorance, or else of hypocrisy, upon some of the foremost leaders of thought both in the ranks of Science and of the Church. It must never be forgotten that the germ of the modern theory of Evolution originated with the Fathers of the Christian Church—Gregory of Nyssa (331-396) and Augustine (353-430)—who, furthermore applied the principle to interpret the first chapter of Genesis. It must never be forgotten that similar views were maintained by Erigena, Roscellinus, William of Occam, Albertus Magnus, and Thomas Aquinas, and that it was not until the days of Suarez (1548-1617) that there was any appreciable change of attitude on the part of the Church.* Finally, it must never be forgotten that since the days of Darwin, and the inauguration of the modern era, there has never failed to be a large number of churchmen and scientists alike who have steadfastly asserted that there was no necessary antagonism between the doctrine of Evolution, properly interpreted, and the well known statements of Holy

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*See Osborn's *From the Greeks to Darwin.*

Writ. We have only to recall such names as those of Wallace, Mivart, Romanes, Asa Gray, LeConte, Winchell, the Duke of Argyll, Maxwell, Lord Kelvin, Wright, Reinke, Wasmann, etc., among scientists who have openly professed belief in the Christian religion; together with such men as Drummond, McCosh, Abbott, Farrar, Kingsley, Temple, Whewell, Illingworth, Aubrey Moore, Moberly, and many others who, as churchmen, have been no less emphatic in professing their belief in some form of the theory of Evolution.

But aside from all this, it is useless to deny the fact of Evolution in Nature, as the development of every oak from the acorn, of every chick from the egg, of every adult, multicellular organism from a single cell or ovum, is living witness to the process. Furthermore, there are few who would deny that the same process obtains within the higher sphere of *racial* development, and that many diverse "varieties" are often "evolved" within a single species. Thus even the most conservative Christian not only admits, but is accustomed to assert most positively that the human race constitutes a single species, and that all the different varieties of Man—white, black, yellow, brown, red races—have been "derived" from a single original pair—the Biblical Adam and Eve;—and this is Evolution. Moreover, there are few even of this class again, who are prepared to deny that this same evolution of varieties—both of plant and animal forms—is taking place constantly before our eyes, and can even be arbitrarily induced under artificial conditions. Whether he believes or not that all the varieties of pigeons—(fan-tails, tumblers, pouters, etc.), have been "evolved" from a single original stock—the wild rock-pigeon (*Columba livia*); or that all the different kinds of dog—from the Great Dane to the poodle—have been "evolved" from a common ancestor; at least he must admit the truth of the principle, for the artificial production of many varieties of domestic cattle, and other animals, is a paying and profitable business to-day, with our breeders; while the success of such horticulturists as Luther Burbank, Nilssen, and others, in the domain of the plant kingdom, has placed this matter beyond dispute.

It is not, therefore, the *fact* of Evolution that is under dispute, but the *extent* of it. No one who understands the question at all can deny that Evolution in some form is going on in Nature; the only question is—*how far does the principle extend?* On this point there is great diversity of opinion. Does the same process by which varieties are "evolved", extend also to species? Have they also been brought into existence in the same manner? Again, can one species be evolved from another? Has the human species been so evolved? And if the principle does apply to the origin of species, as well as of varieties, are we to understand that all species have descended from a single ancestral type, or have there been a number of such original types? Have all the species of a single genus, all the genera of a single family, all the families of a single order, all the orders of a single class, and all the classes within a given phylum, sprung from a common source? Have all forms of vertebrate life, for example, descended from a single ancestral individual, or pair of individuals; or is vertebrate life itself of multiple origin? Again, if all have descended from a common form, does the same law apply to all the other phyla of the animal kingdom, and do these phyla in turn descend from a single original? Does the same law which obtains in the animal kingdom obtain also in the plant kingdom, and do animals and plants themselves originate from a common source?

But we need not stop here. Assuming that plants and animals have sprung from *Protista,* what has been the origin of these? Was the first unit of protoplasmic life a special creation, or was Life itself, in turn, evolved from non-living Matter? And if this last hypothesis is to be accepted, was Matter itself created by special fiat of the Deity, or are we to suppose with Haeckel that Matter is eternal, and that there has been no beginning and there can be no end of the material universe, and that Evolution is a cosmic process that has, without any interruption, been going on from all eternity? These are some, of the many questions upon which scientific opinion has ever been divided, and which because of the enormous implications involved, are of vast interest and importance to professing Christians. We purpose to consider them at length in the following pages.

Without further delay, therefore, let us proceed immediately to sketch in brief outline the more important interpretations of these problems which have, from time to time, engaged the attention of the scientific world.

CHAPTER I

Outline of the Theory of Evolution

AS early as the latter half of the Eighteenth Century, Buffon had stressed the direct influence of environment as in all probability the cause of those slight modifications of structure which, in the course of time, were destined to be developed into specific differentiations. Lamarck followed with his theory respecting the use and disuse of organs, in which he maintained that the exercise of any organ constantly tended to increase its development, while its disuse resulted in gradual atrophy and decay.

With this principle established, he further sought to prove that the various organs and other structures of living beings both originated and developed in strict response to the efforts put forth by the organisms in the attempt to satisfy their various wants and desires. He further assumed that the modifications of structure, so originated and developed by any individual, were naturally transmitted to posterity (inheritance of acquired characters). Lamarck believed that these two simple principles were, in themselves alone, sufficient to account both for the origin and development, as well as for the atrophy and disappearance, of variations, and so supplied the key to the whole process of Organic Evolution. It is to be noted that he did not follow Buffon in supposing that the direct influence of the environment could effect the result.

But while these speculations of Lamarck were of real importance, and destined to be the cause of considerable discussion in the future, they did not, at the time, command any particular attention; and although a number of other writers continued, from time to time, to advocate the general idea of Evolution and to anticipate various phases of its modern interpretation, it was not until Herbert Spencer, Darwin, and Wallace appeared upon the scene with their remarkable contributions to the subject, that the cause of the Evolutionists was finally won.*

Again, while it may be said that it is to Darwin and Wallace, especially, that the world owes the more technical, *biological* interpretation of the theory, yet it is to Herbert Spencer, more than any one else, that we are indebted for the conception of Evolution as an universal or cosmic process. Indeed, this distinguished writer anticipated Darwin and Wallace in his insistence upon the general idea, and while doing little more than to follow the latter in their application of the theory to organic life, far surpassed them in his prophetic vision of its philosophic significance, the theological questions it would necessarily involve, and the light which it was destined to shed on numberless problems connected with "the Riddle of the Universe." "Darwin did not pretend to go beyond the extension of a few types in the organic world or to develop their genesis. He was content to demonstrate the origin of species in the organic world and left unsolved and undiscussed the general origin of things—a much larger task. Spencer sought to make intelligible the process of Evolution throughout the whole field of Nature." In attempting to define this universal movement of the cosmos "he (Spencer) variously expressed the process as the passage from the simple to the complex, from the homogeneous to the heterogeneous, from indefinite homogeneity to definite heterogeneity, and so on." But while the correctness of this formula is ad-

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*As in the case of other discoveries, the exact origin of the modern interpretation of the Evolution theory is difficult to determine. The idea was partially anticipated by a number of writers. The "Natural Selection" factor, (peculiarly stressed by Darwin and Wallace) appears to have been foreseen by three writers only, viz: Dr. W. C. Wells (1813), Patrick Matthew (1831) and the French botanist, Charles Naudin, (1852). Of these three, the work of Dr. Wells, a native of Charleston, S. C., "is certainly the most complete of all the anticipations of Darwinism." (Osborn—*From the Greeks to Darwin*, pp. 221, 222). This eminent physician, surgeon, scientist and writer, was born in Charleston, S. C. in 1757, where he received his primary education. Later he went to the University of Edinburgh, where he graduated in 1780. Returning to his native city, he remained there a number of years, and finally removed to London where he continued to live, receiving many honors at the hands of the scientific public. He died Sept. 18, 1817.

mitted, even in biological circles, it has never been regarded as anything more than a very general outline of the process, and not sufficiently exhaustive to meet the demands of the technical Evolutionist, especially in his controversy with the old school "Developmentalists."

Spencer's distinct services to the cause of organic evolution, however, have never been doubted, and Darwin himself acknowledges him as a pioneer in this department in the very opening chapter of the *Origin of Species*. "Mr. Herbert Spencer," says he, "in an Essay (originally published in the "Leader", March, 1852, and republished in his *Essays*, in 1858), has contrasted the theories of the creation and the development of organic beings with remarkable skill and force. He argues from the analogy of domestic productions, from the changes which the embryos of many species undergo, from the difficulty of distinguishing species and varieties, and from the principle of general gradation, that species have been modified; and he attributes the modification to the change of circumstances." (*Id.* Introduction). He was a strong advocate of the Lamarckian principle regarding the inheritance of acquired characters, and in the reaction which later took place concerning this matter, boldly asserted that, "*Either there has been an inheritance of acquired characteristics or there has been no Evolution.*"

His most important contribution to the subject, however, was his systematic attempt to prove that the process of Evolution was an *universal* movement, characteristic of the entire cosmos, and the further implications of this fact for Philosophy and Religion. The strictly biological aspect of the matter, he left to his illustrious contemporaries, Darwin and Wallace. The key-note of their message was the doctrine of Natural Selection. Neither of these writers concerned himself particularly with the origin of those minute "variations" of structure which all parties recognized were really at the bottom of the whole problem, but accepting these "variations" as actually given, they proceeded to enunciate the law which governed their further development or decay.

Noting the fact that among the offspring of any given pair, no two individuals were ever exactly alike, or perfectly reproduced all the peculiarities of their parents, they assumed that a tendency to slight, "indefinite" variation of structure was innate in every living organism. They did not attempt to account for the *cause* of this tendency to variation, they simply noted it as a fact, and further assumed that it was "indefinite"—i. e., tending to manifest itself "fortuitously" in any direction. This being the case, it was further obvious that among all the slight modifications of structure with which each individual was endowed, some would be adapted to the conditions of the surrounding environment, while some would not be so adapted, and since adaptation to environment is obviously necessary to the continued existence of any organism, it would result that these individuals which happened to possess variations in harmony with the demands of the environment would survive in "the struggle for existence," while those which were not so fortunate as to possess such "favorable" or "useful" variations, would necessarily perish. Moreover, as it was also assumed (following Lamarck) that such variations of structure could be transmitted to posterity, not only would the ultimate result of the whole process be the "survival of the fittest" (i. e., of those possessing the most "useful" modifications of structure), but since environment itself was constantly changing in the course of ages, this process of variation would be indefinitely extended until the descendents of the same pair would, in the course of time, differ so widely among themselves that their common relationship would be no longer suspected. With such a principle admitted, and unlimited time in which to operate, it was apparent that all the manifold diversity among living organisms could be accounted for. From such slight variations or modifications of structure, resulted varieties; varieties, in time, differentiated into species, species into genera, genera into families, families into orders, orders into classes, and classes into phyla.

In short, it was apparent from these considerations that there was a *selective* process going on constantly in Nature, whereby the "fit" (i. e., those individuals which possessed variations peculiarly fitted to the environment) were being constantly chosen or "selected" for preservation, generation after generation, while the "unfit" were being as constantly thrown aside or rejected. In yet further proof of this theory of natural selection, Darwin stressed the remarkable results of the similar, "artificial selection" which breeders have been carrying on for generations before our very eyes. We are all aware of the extraordinary modifications which have thus been gradually brought about in domestic animals, such as dogs, horses, sheep, pigeons, etc.; in food-plants, as cereal grains, garden-vegetables, etc.; and in ornamental plants, as roses, dahlias, pinks, etc. In the opinion of most naturalists, all our different varieties of pigeon—carriers, tumblers, runts, barbs, pouters, fantails, etc.,—have descended from a common stock, the rock-pigeon (*Columba livia*); and while the evidence for the common origin of all our other domestic animals, as well as of our cultivated plants, is not so clear, yet whether derived from a single source or a few originals, there can nevertheless be little doubt that the immense number of varieties now existent have, in the main, come into existence through the selective agency of man alone, who has, for centuries, been creating new forms at will.

But while this most simple and beautiful explanation appears reasonable—so reasonable, in fact, that it won the assent of nearly the entire scientific world for many years—yet it has its serious defects, which its opponents have pointed out from the very beginning, but which have only within the past two or three decades been given the attention they deserve. Thus, one of the difficulties enunciated at the very outset, and indeed anticipated by Darwin himself, was the well known tendency of all varieties to "revert" to the original type. This can only be prevented, by keeping diverse varieties apart, prohibiting the possibility of inter-crossing.

Now, in the case of our domestic varieties, this tendency is overcome by the constant care which the breeders exercise to effect such isolation artificially. It is easy, therefore, to understand how these artificial varieties are caused to breed pure. But what is there in Nature that can take the place of this constant and purposive action of man? Darwin partly met the objection by resorting to the theory of migration, which was later developed, and to some extent supplemented, by Moritz Wagner's theory of geographical isolation. That such separation through migration and accidental geographical isolation will readily account for the matter in many cases, is unquestionable, and the fact that widely separated geographical regions are characterized by distinct faunas and floras, tends strongly to confirm the hypothesis. On the other hand, this explanation applies only to organisms in which the sexes are distinct, and is powerless to explain the origin of species either among asexual organisms, or among those which propagate through self-fertilization, and these two groups combined form no small percent of the organic kingdom. Furthermore, the existence of distinct species in such widely isolated geographical regions, does not—even in the case of sexually distinct organisms—prove necessarily that they have come into existence by means of the principle enunciated by Darwin, for this principle further assumes, without advancing proof, that varieties, if only isolated long enough, necessarily become cross-sterile, thus attaining the rank of distinct species. But what evidence is there to prove this? Indeed if distinct species, which cannot breed *inter se*, are really developed out of varieties which are always fertile *inter se*, through the process of natural selection alone, how is it possible to explain the enigma?

Here the *physiological selection* of Romanes, and certain other closely related hypotheses, have been brought to bear upon the subject. In the opinion of Romanes, the matter can only be accounted for upon the assumption that the tendency to variation affects reproduction no less surely than other functions. We cannot better present this explanation than by quoting the following description of the hypothesis which is given by Le Conte. "According to Romanes, no organs are so subject to varietal changes as the reproductive, and these in no respect so much as in degrees of fertility. Unfortunately, these changes are not visible, and must be judged of only by the results. It is not uncommon, for example, to find sterility between individuals (sexual incompatibility) who are both of them perfectly fertile with other individuals. Similarly, cross-sterility, partial or complete, is not uncommon between varieties or races, as Mr. Darwin has long noticed. It very generally, as we know, occurs between, and, in fact, is constantly used as a test of species. Now, this cross-sterility with the parent stock, which we find so constant a character of species, and which, therefore, must have commenced as a partial cross-sterility in varieties, is it *antecedent* or *consequent* to other variations? It has been usual to suppose it consequent to a certain amount of divergence, viz:, that which constitutes, or at least approaches, species. But, according to Romanes, it is antecedent. Among many other variations, this is the one which originates species, because it prevents reversion by cross-breeding with the parent stock, and insures true breeding with its own kind. In a word, it sexually isolates the species. Suppose, then, a species multiplying indefinitely in one locality: trivial variations of many kinds, and in many directions, occur among the offspring. These are merged by cross-breeding into the original type, which, therefore, remains unchanged. But, from time to time, among these variations there occur some affecting the reproductive organs in such wise as to produce partial or complete cross-sterility with the parent form. This is the beginning of a new species."*

But this most important suggestion was destined to open up yet other possibilities which, in time, were to lead to considerable discussion as to the adequacy of the Darwinian interpretation to explain the problem at all. Fastening the attention upon the reproductive function, it was calculated not only to stress the importance of this particular factor, but further to raise the question as to how far the influence of natural selection could be relied upon to account for the variations at all. Indeed, it had long been argued by the opponents of Darwin, that, at best, the principle of natural selection could never be regarded as the *cause* of specific differentiation, as it was obvious from Darwin's own theory, that natural selection did not *originate* the initial variations which were assumed to lead ultimately to specific distinctions, but merely determined which of these already given variations should survive, and which should perish. To account for the origin of species, one must account for the origin of these initial variations, and this the theory of natural selection admittedly failed to do. What now if these variations affecting the reproductive functions were caused by an *internal* agency, rather than the effect of external influences? Under such circumstances, a very different conception of the evolutionary process would result. The possibility of such a thing had long been urged, and with the failure of the Darwinians to assign a cause for these initial variations, which were, obviously, the most important data to be accounted for, the validity of the whole hypothesis—so far as it pretended to explain the "origin of species"—was at stake.

**Evolution and Its Relation to Religious Thought*, pp. 77, 78.

Taking advantage of this serious defect, the Orthogenesists—Cope, Nägeli, and a long line of more recent writers—have been quick to urge the dominance of an *internal directing principle* as the real cause of variation. As to how far the effects of the operation of this inner principle are modified by external conditions and agencies, opinions are divided. Nägeli appears to be the only one bold enough to assert its complete supremacy—altogether "independent of the influence of the outer world." But while very few of those who profess belief in orthogenesis are disposed to agree with this extreme position of Nägeli, yet there is a very formidable array of authority for the general fact of an inner directive agency in organisms which ever strives to realize a certain definite goal in spite of the opposition of unfavourable conditions and antagonistic external influences, and which in the long run, has distinctly triumphed. It is not assumed that the energy of this internal principle is not often successfully opposed in specific directions, but only that in the face of numberless such failures, it nevertheless, in the long run, "outwits" these antagonistic influences and ultimately attains its goal. Whether there be a "vital principle" or not, there is something strangely rational in the behaviour of all living organisms—a persistent attempt to attain a definite end in spite of adverse circumstances—and it is this that orthogenesists of all grades agree in insisting upon. With Cope this inner directive principle is nothing more or less than the rational agent—*Mind* itself (i. e., consciousness—"archaesthetism") the mind of the organism which intelligently directs its progress, and thus, with him, all "*Evolution is essentially a process of mind.*"

Nägeli, on the contrary, insists that the principle operates blindly and mechanically. It is "*an automatic perfecting principle (autonome Vervollkommnung)*"—"a something inherent in the organic world which makes each organism in itself a force or factor making towards specialization, adaptation, that is toward progressive evolution." So dominant is the power of this principle, in the opinion of Nägeli, that it completely overshadows and discredits the Darwinian factors. In short, he "believes that animals and plants would have developed about as they have, even had no struggle for existence taken place and the climatic and geologic conditions and changes been quite different from what they actually have been." Korschinsky also takes a similar view, maintaining that "in order to explain the origin of higher forms out of lower, it is necessary to assume in the organism a special tendency toward progress." While not holding such pronounced opinions, and, indeed, treating the subject from various points of view, mention must also be made of the approval given to the central idea of orthogenesis by Pfeffer, Eimer, Cunningham, Ernst Koker, Cook, Henslow, Bashford Dean, Plate, Rosa, Jaeckel, Delage, Whitman, etc., and the marked tendency upon the part of most palaeontologists to maintain the theory in one form or another. Moreover, such eminent palaeontologists as Osborn, Williston, Hyatt, Smith,—"all voice their belief in the existence of evidence in the history of the evolution of these animal groups for orthogenetic variation and descent." This evidence, coming from the actual "record of the rocks," and not in consequence of mere theoretical speculation, is indeed most weighty and convincing. Finally, it must further be remembered that all "vitalistic" conceptions are closely related in principle to those inculcating orthogenesis, and that thus the Neo-Vitalism of Wolff and Driesch must also be considered in this connection.*

But side by side with this reaction on the part of the advocates of orthogenesis, there were destined to arise several other hypotheses all more or less modifying—when not actually opposing—the Darwinian view. Among the foremost of these was Weismannism. Not only did Weismann look to the reproductive system to discover the cause of variation, but further pointed out the profound distinction which existed between the reproductive cells (germ cells), and the ordinary body cells (somatic cells). These two classes of cells are early differentiated, the latter growing out of the former which are alone the vehicles of heredity. The gist of the theory consists in the assumption that the external influences which affect and modify the somatic cells of the individual, have no effect upon the germ-plasm (the substance of the germ cells), nor are they at all influenced by the habits of the organism, and that such "acquired characteristics," therefore, are never inherited. Only those characters which are inherent in the germ plasm can ever be transmitted, but because of the constant inter-mingling of the germ-plasmas of different individuals as the result of amphimixis (sexual union) there is endless redistribution of these germinal characters, with the result that no two individuals are ever alike. Variation thus proceeds from amphimixis, and not as a consequence of any modifications of the somatic cells through external influences. Speaking generally, Weismannism flatly denies the Lamarckian factors, and by wholly denying that "acquired characters" can ever be inherited appears, at first sight, to antagonize the fundamental assumption of Darwinism. However, what he denies to the traditional Darwinian view in one form, he gives back in another. He is far from denying natural selection. He merely insists that natural selection works through amphimixis, and not, as generally supposed, through external influences affecting the somatic cells. So emphatic is Weismann in his advocacy of natural selection under these conditions that his theory is now frequently alluded to as the Neo-Darwinian view.

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*Driesch and Wolff are perhaps the best representatives of Vitalism today. According to the former, "neo-Vitalism demands the assumption of an extra-physico-chemical factor (called 'Psychoid' . . .) which is an attribute of, or essential kind of potentiality pertaining to organized living substance, and not found in, nor influencing inorganic bodies." It is safe to say that—despite the prejudice of mechanists—the necessity of some such assumption is slowly forcing itself upon the attention of biologists. It is noteworthy that Driesch himself started out a radical mechanist, and men like J. A. Thomson, J. S. Haldane, Pavlov, Prof. Wm. Patton and many others are now enrolled among the supporters of the theory.

But while the attitude of Weismann only directly affected the Lamarckian factors incorporated by Darwin, and was otherwise strong in its defense of the Darwinian view, nevertheless the added emphasis placed upon the germ plasm as the origin of variation continued to make itself felt, and upon the subsequent re-discovery (1900) of the experimental work of the Roman priest Gregor Mendel, the adequacy of the Darwinian interpretation was still further threatened. Weismann had already elaborated a very complex theory as to the constitution of the germ plasm, and the further results of Mendelism only added weight to the idea that all variation was to be accounted for on the principle of the diverse combinations of certain unalterable "units" inherent in the plasm, and that the principle of natural selection had little or nothing to do with the matter. In a word, the net-result of these opinions as now developed by a large school of scientists is to make variations which lead to the beginning of a new species a matter depending upon the combination and concomitant suppression of certain ultimate particles—organic atoms (genes)—resident in the germ plasm. Just as the chemical atoms unite in various proportions to form the most diverse compounds, so these plasmic "atoms" unite to form the most diverse organic compounds. The influence of Mendel's discovery has revolutionized the whole subject of heredity, and has inaugurated a new science—"Genetics"—of which the famous English biologist, Bateson, and the American T. H. Morgan are the leading exponents. If these principles be accepted they seriously impugn the views both of Lamarck and Darwin, for according to this school, the influence of external conditions which affect only the somatic cells, is never inherited.

A brief account of Mendel's experiments with peas must suffice as an illustration of the principle. "He crossed tall yellow peas with dwarf green peas, with the result that the first hybrid generation turned out to be all tall yellows. However, in the second hybrid generation they split up . . . For out of every sixteen plants, there were nine tall yellows, three dwarf yellows, three tall greens, and one dwarf green. It is evident that these tall greens and dwarf yellows are really new forms;" (i. e., altogether diverse from either parent) "and further experiments proved that *they can be separated out or segregated and grown as pure forms which thereafter breed true* . . . . The kinds so produced are termed mutants, and at first they were hailed by enthusiastic scientists as 'elementary species' . . . . But the enthusiasm with which this applied result of Mendel's Law was at first hailed by biologists has gradually subsided; for it has been found that though these new forms will breed true under certain conditions, they are nevertheless cross-fertile with the original forms, and thus *the circle can be completed* back again by a return to the parent form, from which the new "species" can again be produced at will with the same mathematical exactness as before."*

These and later experiments, coupled with the apparent evidence that acquired characteristics are not inherited, has led Bateson to the conclusion that Evolution in the Lamarckian and Darwinian conceptions of that term, does not exist; and "if we have to dispense, as seems likely, with any addition from without, we must begin seriously to consider whether the course of Evolution can at all seriously be represented as an unpacking of an orginal complex which contains within itself the whole range of diversity which living things present."§ In short, the substance of Bateson's view may be summed up by saying that many, if not all, of those diverse forms now commonly regarded as "species" are, in reality, nothing more than "variations" ("varieties") of an "original complex" ("synthetic type").

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*Geo. McC. Price, *Q. E. D.*, pp. 88-90.

§Bateson, Address on Heredity, before International Medical Congress, London, 1913.

This "original"—*the true species*—held within its integral the potentials of all subsequent forms, which are, after all, but so many diverse actualizations of different combinations of these potentials, much in the same way as the thousands of different words in the English language are but so many diverse combinations of twenty-six letters.*

Closely related on some important points with these theories, again, is the somewhat earlier "Mutation Theory" of the Dutch botanist, DeVries, an hypothesis built upon a long line of speculation having for its basis the idea that Evolution is characterized by periodic "leaps" or "saltations." Darwin himself had given much attention to the subject of "sports," but after long and careful consideration of the matter, had concluded that they played no important part in the origination of species. Even among his followers, however, there were many that questioned the validity of this conclusion. It had been pointed out, as a serious objection, that Evolution proceeding *solely* through slow, infinitesimally small changes, could not be reconciled with the requirements of geology. Vast as the ages of geology were, they were not long enough to account for all the numberless species of plant and animal life that had appeared since the first dawn of life on this planet, unless the pace of Evolution could be materially quickened. Even his friend Huxley warned him of the danger, and wrote significantly, "Mr. Darwin's position might, we think, have been even stronger than it is if he had not embarrassed himself with the aphorism, '*Natura non facit saltum,*' which turns up so often in his pages. We believe, as we have said above, that Nature does make jumps now and then, and a recognition of the fact is of no small importance in disposing of many minor objections to the doctrine of transmutation."[§]

Nor was the element of time the only difficulty. There were other matters as well, that strongly suggested the possibility of abrupt and rapid changes from time to time, and as a consequence we find a number of writers urging such a principle as the real cause of the origin of species in opposition to Darwin. Thus, as early as 1864, the celebrated zoologist Albert von Kölliker wrote in defense of such a theory as "against the adequacy or actuality of natural selection", while Dall, Galton, Emery, Cope, Dollo, Scott, Korschinsky, and numbers of others continued to stress its importance. It was left for DeVries, however, to formulate the idea in a definite theory of development backed by substantial evidence. In his now epoch-making discovery at Hilversum, near Amsterdam, of a number of Evening Primroses (*Oenothera lamarckiana*) growing wild in a potato field, and producing new mutants or "sports" which apparently continued to breed true to form, DeVries suspected that he had found the evidence he had so long been seeking. Taking a number of specimens home to his experimental gardens in Amsterdam, he set to work to cultivate them. After many years of patient observation, he apparently proved the truth of his hypothesis. It had long been objected to Darwinism, that it had never been able to prove its fundamental assumption by direct observation—no species ever having been directly seen to originate under the conditions laid down; but here was the evidence of species originating by "mutation" under one's very eyes. Moreover, *lamarckiana* continued to give off such mutants under the closest scrutiny of many other observers, so that the phenomena in question seemed hardly to be open to dispute.

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*See Note at end of this chapter.

[§] *Lay Sermons*, p. 297

Nor was DeVries satisfied with merely convincing the world as to the facts in question. He further elaborated a theory of "periodic" mutations to account for the origin of species, which was destined for a while, to hold its own as a formidable opponent of the Darwinian doctrine. It would take us too far afield to enter into the details of this theory, and we shall content ourselves merely with summing up some of its main features in the words of the author himself. "Since the publication of Darwin's theory," says he, "the probability of such sudden changes playing an important part in the evolution of species has always found some support. Of late the evidence has increased in this direction, especially under the influence of Cope. Discontinuous Evolution has been defended among palaeontologists by Dollo, among zoologists by Bateson, and among botanists by Korschinsky . . . The conception of mutations agrees with the old view of the constancy of species. This theory assumes that a species has its birth, its lifetime, and its death, even as an individual, and that throughout its life it remains one and the same. Thus it is only natural that wild species are almost always observed to be constant, since by a mutation they do not change themselves, but simply produce a new type. This is allied to its ancestor as a branch is to a tree, the stem continuing its growth, no matter how many branches it produces. Just so a species may produce quite a number of new forms without being changed itself, in the least, thereby . . . . species are derived from other species by means of sudden small changes which, in some instances, may be scarcely perceptible to the inexperienced eye. From their first appearance they are uniform and constant, when propagated by seed; they are not connected with the parent species by intermediates and have no period of slow development before they reach the full display of their characters. They do not always arise, but only from time to time. A parent species may produce its offspring separately at intervals, or in large numbers during distinct mutating periods. After this production, the old species is still the same as it was before, and it subsists in the midst of its children."*

But it must not be supposed that even this remarkable discovery, with its apparent implications, was allowed to go unchallenged. True, there could be little question as to the reality of the actual phenomena furnished by *lamarckiana,* but the further problem immediately presented itself—can it be proved that this exceptional primrose is itself a pure species and not a hybrid. It was around this vital question that the battle next began to rage, and the inability of DeVries to establish the purity of his stock beyond all question, naturally resulted in materially diminishing the value of his theory. But while the validity of the argument, so far as it was built upon *Oenothera lamarckiana* and the peculiar interpretation of De

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**Plant Breeding,* pp. 8-10.

Vries, was thus seriously impugned, there were still those who contended for the underlying principle of the mutation theory. The importance of the discovery of Mendel continued to make itself felt, and under the leadership of men like Bateson and T. H. Morgan a new science has developed which claims to have revolutionized the entire theory of development. As to the finality of this claim we must, perforce, be a little sceptical, for while fully admitting the probability of the fundamental principle involved in the general theory of genetics—which, indeed, is unmistakably supported by a formidable array of experimental evidence—it is hardly possible, at this stage in its development, to foresee its ultimate implications, and so to gauge its precise relation to many of the fundamental problems of Evolution.

We may indeed admit as highly probable the following widely received opinions. First, the existence of the fundamental unit—the gene—as well as the general law of developmental variation through the additions and losses of such genes. We may also accept the discovery of Morgan regarding "the location and linkage of the genes in the chromosomes." We may further accept the distinction between 'mutations' proper, and 'transmutations', and the further theory that "the transmutation of chromosomes and genes. . . leads to the creation of new varieties and species." And so, carrying on the argument, we may arrive finally at the conception of an hypothetical "Genetical Species" as probably the real unit with which the evolutionist must deal. The evidence for all these conclusions is, indeed, most reasonable and impressive, but it must not be imagined that in accepting them, provisionally, we can certainly foresee their implications for the theory of Evolution. Until we know more about the number and nature of the original "Genetical Species";—until we are able to identify them in terms of present sub-genera, genera, or other groups, it is manifest that we are far from solving the problem. Who knows whether organic Evolution is monophyletic or polyphyletic as long as the precise character of these Genetical Species is undetermined. While throwing new and valuable light, therefore, upon the possible *modus operandi* of the process, the theory as it now stands offers no actual solution of the main problem.

Taking up the hint which the geneticists offer us, however, as to the existence of a Genetical Species, we must now turn our attention to another aspect of the problem. Up to this time we have dealt mainly with the various speculations regarding the actual factors involved in the process of Evolution. We shall now glance more particularly at the *scope* of the process—i. e., the various opinions which have been entertained regarding the range over which an unbroken or continuous evolution may be regarded as operative. Is Evolution indeed an *universal, unbroken* process extending, as Spencer imagined, throughout the entire cosmos? Does the same Law which governs the movement in the inorganic sphere, obtain also in the organic—the latter being merely a continuation of the former? Or are there two distinct processes, governed by equally as distinct laws, within these two domains?

Despite the confident asseverations of Prof. Haeckel and his followers, as well as the entire orthodox school of thorough Monophyletic Evolutionists, who insist that there can be no "interruption" of the process anywhere in Nature, such eminent authorities as Professors Jordan and Kellogg emphatically deny this supposed continuity between the inorganic and the organic processes. "Biological evolution and cosmic evolution are *not* the same," is their clear-cut assertion. "In organic and inorganic evolution there is much in common, so far as conditions and results are concerned; but these likenesses belong to the realm of analogy, not of homology. *They are not true identities,* because not arising from like causes. . . .The relatively little the two groups of processes have in common has been overemphasized as compared with their *fundamental differences*. . .To regard cosmic evolution and organic evolution as identical or as phases of one process, is to obscure facts by verbiage. . .It is not clear that any force whatever or any sequence of events in the Evolution of Life is homologous with any force or sequence in the Evolution of stars and planets."*

**Evolution and Animal Life*, cited by Stackpole, *Biology*, pp. 128, 129.

Nor are these the only authorities who could be mentioned, for the question of Abiogenesis, or the evolution of the living out of the non-living, has always been a moot one even amongst many who accept the principle of Evolution within the organic sphere.

But again, even within this latter sphere, the question presents itself: Is it necessary to believe only a *single* system obtains, or is there a plurality of such systems? In short, is organic Evolution monophyletic or polyphyletic? Contrary to a very widespread impression, there is great diversity of opinion amongst the best authorities on these points. Without stopping to review the various conceptions entertained before the days of Darwin, we may say that the initiator of the modern theory was himself strongly inclined to a polyphyletic rather than a monophyletic view. The reason for this is obvious. Darwin grew up in an age when practically the entire scientific world had accepted the four fundamental types of Cuvier—Vertebrata, Articulata, Mollusca, and Radiata. Each of these groups of animals appeared to be fashioned after a specific plan or pattern widely different from the remaining three, and it was the firm conviction that they could never be shown to be related *inter se*. Thus, ignoring minor but still important distinctions, it was obvious that the vertebrate animals were all peculiarly distinguished by an internal skeleton of characteristic type, as well as by the possession of a dorsal nerve-chord, and ventral heart. The articulates, on the other hand, possessed a ventral nerve-chord and dorsal heart, and were characterized by an external, horny, or chitinous skeleton rather than an internal and osseous one. The Molluscs again differed profoundly from both of these, being non-articulate organisms, with soft, sack-shaped bodies, and for the most part, secreting calcareous shells. Finally, the Radiates were as clearly differentiated from the three preceding, by the fact that their bodies appeared to be a "combination of four or more main sections united in the form of radii (antimera)." It is true that when the *Origin of Species* appeared, changes in this classification were already being discussed, and it was not long before the Radiates were divided into the two groups Echinodermata and Coelenterata, while the unicellular organisms, hitherto regarded merely as the larvae of higher, multicellular forms, were now added as a new phylum under the name of Protozoa.

But at the time Darwin wrote these modifications had not been formulated, and only the *possibility* of some further changes in the Cuvierian classification was under contemplation. It was for this reason that Darwin only insisted upon the validity of his principle within the limits of each kingdom, without attempting to prove that each of these, in turn, were necessarily branches from one, original stem. He refers to the possibility, indeed, of such a monophyletic origin as in harmony with analogy, but significantly adds—"Analogy may be a deceitful guide." In short, all he earnestly contended for was the fact that his law of Evolution by means of natural selection accounted for the origin of species *within each of these generally recognized, independent Kingdoms.* He also hints at the further possibility of there being more than four such Kingdoms —perhaps, "four or five," in the case of animals, and "an equal or lesser number," in the case of plants, each of which (let us mark this fact) originated by distinct fiat of "*the Creator.*" His actual words are these:—"I believe that animals are descended from at most only four or five progenitors, and plants from an equal or lesser number. Analogy would lead me one step further, namely, to the belief that all animals and plants are descended from some one prototype. But analogy may be a deceitful guide. . . .From some such low and intermediate form, both animals and plants may have been developed; and, if we admit this, we must likewise admit that all the organic beings which have ever lived on this earth, may be descended from one primordial form. But this inference is chiefly grounded on analogy, and it is immaterial whether or not it be accepted. . . . ," but "as I have recently remarked in regard to the members of each great kingdom, such as the Vertebrata, Articulata, etc., we have distinct evidence in their embryological, homologous, and rudimentary structures, that *within each Kingdom* all the members are descended from a single progenitor. . . .There is a grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that while this planet has gone circling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved"*

It will thus be seen that while Darwin did not deny the possibility of monophyletic Evolution, he nevertheless insisted that a polyphyletic interpretation was the only one that could really be defended scientifically. It was left to Haeckel and the more radical exponents of the doctrine to insist so strenuously upon the origin of all forms of life from a single progenitor. The audacity of Haeckel and his school in proclaiming such a view as a scientifically demonstrated fact, only shocked Darwin. "Your boldness makes me tremble," is said to have been his comment when addressing Haeckel.§

In addition to the cautious polyphyletic conception favoured by Darwin, we find Wallace, Mivart and others, contending no less ardently for the separate origin of the soul of man. Indeed, it is a curious fact that the man who shared with Darwin the honor of having discovered the principle of natural selection, and who insisted far more rigidly upon its importance, then he, should have flatly denied its applicability in the case of the human mind. "Man," says Wallace, "is to be placed 'apart,' as not only the head and culminating point of the grand series of organic nature, but as in some degree *a new and distinct order of being*. . . .Man has not only escaped 'natural selection' himself, but he is actually able to take away some of that power from nature which before his appearance she universally exercised."† Again in a later work, entitled, "*Darwinism: An Exposition of the Theory of Natural Selection*, page 463, he wrote, "Because Man's physical structure has been developed from an animal form by natural selection, it does not necessarily follow that his mental nature, even though developed *pari*

**Origin of Species*—Concluding chapter.

§See *Letters*, edited by his son, Francis.

†*Natural Selection*, p. 324.

passu with it, has been developed by the same causes only." Referring especially to the peculiar psychical powers of man, he continues—"These facts taken in their entirety compel us to recognize some origin for these faculties referred to, wholly distinct from that which has served to account for the animal characteristics of Man, whether bodily or mental. The special faculties we have been discussing clearly point to the existence in Man of something which he has not derived from his animal progenitors—something which we may best refer to as being of a spiritual essence or nature, capable of progressive development under favourable conditions. On the hypothesis of this spiritual nature *superadded to* the animal nature of Man, we are able to understand much that is otherwise mysterious and unintelligible in regard to him, especially the enormous influence of ideas, principles, and beliefs over his whole life and actions."* He has also been quoted as follows: "We find that the Darwinian theory, even when carried out to its extreme logical conclusion, not only does not oppose, but lends a decided support to, a belief in the spiritual nature of Man. It shows us how Man's body may have been developed from that of the lower animals under the law of Natural Selection; but it also teaches us that we possess intellectual and moral faculties which could not have been so developed, but must have another origin, and for this origin we can find an adequate cause only in the unseen universe of Spirit."

Precisely the same view was maintained by Mivart. "Man, according to the old scholastic definition," says he, "is 'a rational animal' (*animal rationale*), and his animality is distinct in nature from his rationality, though inseparably joined, during life, in one common personality. *This animal body must have had a different source from that of the spiritual Soul which informs it,* from the distinctness of the two orders to which these two existences severally belong. Scripture seems plainly to indicate this when it says that 'God made man from the dust of the earth, and breathed into his nostrils the breath of life.' This is plain and direct statement that man's body was not created in the primary and absolute sense of the word, but was evolved from pre-existing material (symbolized by the term 'dust of the earth'), and was therefore only derivatively created, i. e., by the operation of secondary laws. His *Soul*, on the other hand, was created in quite a different way, not by any pre-existing means, external to God himself, but by the direct action of the Almighty, symbolized by the term 'breathing': the very form adopted by Christ, when conferring the supernatural powers and graces of the Christian dispensation, and a form still daily used in the rites and ceremonies of the Church. That the first man should have had this double origin agrees with what we now experience. For supposing each human Soul to be directly and immediately created, yet each human body is evolved by the ordinary operation of natural physical laws.*

**Id.* pp. 473, 474.

It goes without saying that the same view respecting man's origin was held by Agassiz, Dubois-Reymond, Virchow, Dana, Dawson, Newberry, Beale, Murchison, and numbers of others,§ who, in whole or in part, rejected the theory of Evolution because of this and similar difficulties. Especially important in this connection, however, are the words of Prof. Dana, not only because of his world-wide eminence as a geologist, but because he lived long enough to see the apparent victory of Darwinism all along the lines, yet continued to the end to be unconvinced. He ever insisted that the actual geological record was incompatible with the specific interpretation of development set forth by Darwin, and when it came to the question of man, was even more emphatic in proclaiming his unique position in the scale of beings. "Man. . .is not one of the Primates, along side of the monkeys: he stands alone,—the *Archon* of mammals. . . . .There is in Man a spiritual element, in which the brute has

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**Genesis of Species*, p. 282.

§The case of the famous Virchow is especially noteworthy in view of the fact that this most renowned authority "was at first favorable to Darwinism, then sceptical and finally rejected it." (Haeckel—*Last Words in Evolution*, p. 38). He is quoted as saying, "It is all nonsense. It cannot be proved by Science that man descended from the ape or from any other animal. Since the announcement of the theory all real scientific knowledge has proceeded in the opposite direction."

no share."* Again, shortly before his death, after having heard the last confident assertions of his antagonists, he again re-asserted his conviction that the intellectual and spiritual faculties of man could never be accounted for as an "evolution" from the lower mind of the animal, and were sufficient in themselves to place man in a separate category from the brute. Even at that hour, he wrote, "The present teaching of geology is that *man is not of Nature's making. . .* .Man's high reason, his unsatisfied longings, aspirations, his free will, all afford the fullest assurance that he owes his existence to the special act of the Infinite Being whose image he bears."**

But again, precisely this opinion is maintained at the present hour by the noted entomologist, Erich Wasmann, of Luxemburg, as well as by a number of those Evolutionists who, for one reason or another, are beginning to favor the theory of "Multiple Origins." We shall have occasion to speak of these more particularly in the next chapter. It is enough at this point, to quote the emphatic assertion of Wasmann:—"Man's spiritual soul is essentially different from a brute soul, and can, therefore, never have proceeded from it by any natural evolution."§ "Because the soul of man is spiritual, it differs from the brute soul essentially, and not merely in degree, and therefore it can exist only as a result of Creation, not of Evolution."† Like Wallace, he recognizes the possibility of man's body being evolved out of that of an animal; it is only to the *mind* and *soul* of man that he emphatically denies the possibility of such an origin. "The essential difference between the mental life of man and the sentient existence of beasts, and the impossibility that an alleged brute ancestor of man should ever have become the first *Homo sapiens* by *natural evolution* are facts that cannot be set aside. Therefore, it is a real 'postulate of science' to account for the mind of man by an act of creation."‡

***Geology*, pp. 573, 574.

***Geological Story*, p. 290.

§*Modern Biology and the Theory of Evolution*, p. 435.

†*Id.* p. 436.

‡*Id.* p. 285.

To those whose view of the problem is not limited to mere biological or physical facts, but who appreciate the psychological difficulties involved in the transition from the animal to the human mind (the hiatus between mere sense-perception and self-conscious ideation, volition, conception, speech, etc.) this interpretation of the matter has always appeared unanswerable, and the further fact that the whole process of human evolution is unique—indeed, the very antithesis, in most respects, of the evolution of the animal—more than confirms this assumption. Despite these considerations, however, which appeared so weighty to men like Dana, Wallace, Mivart, and numberless other writers whose field of observation was not tied to mere physical phenomena, it is only very recently that the true significance of the difficulty here presented has begun to dawn upon some of our Evolutionists. It is gratifying to know that so eminent an authority as Prof. Henry Fairfield Osborn has now frankly acknowledged the deep importance of this psychological fact and its bearing upon the subject of Evolution. In his speech, recently delivered at Ithaca, N. Y., he candidly stated that "the spiritual faculties of man cannot be accounted for 'by purely evolutionary processes'. . . .He also cited the mathematical and artistic faculties of man as 'new attributes to the human race without antecedents and not to be accounted for by Evolution,' " (Associated Press Report).

But while these polyphyletic opinions, as will now be seen, were early advocated, they were destined to suffer a long eclipse, because of a strong counter movement to which the majority of biologists gave their allegiance. It is to Ernst Haeckel, more than to any other one man, that the success of this latter, thorough-going monophyletic interpretation of the matter is due, and before we can tell the story of the reaction which was destined to follow again upon the wide-spread acceptance of his views, it will be necessary to speak at some length of the precise character of his contribution to the subject.

NOTE

The net result of the development of the Mendelian principles may be presented as follows:—Weismann's theory of the germ plasm conceived that substance as exceedingly complicated in character, and consisting of divers orders of units—to wit: (going up the scale) Biophors, Determinants, Ids, Idants, and Chromosomes. Except for the last mentioned. these were all more or less hypothetical entities, and more recent research, based upon Mendelian principles, has now abandoned this view altogether, and regards the chromosomes as built up of a number of ultimate organic particles called genes. These genes are assumed to be the bases of the "characters" displayed by organisms. "According to one theory, each character has a definite gene, and is paired with another equally definite, but occupying the role of recessive. Since one gene must come into the organism for each parent, it follows that in a fertilized egg there will be either two genes of the same sort, or one belonging to each member of every pair . . . There are several geneticists, however who disagree with it. According to them a character either is present or it is not, so that in a pure dominant it is represented by two genes, in a hybrid between dominant and recessive, by one, and in a pure recessive by no genes at all for the particular character in question," (Fenton).

Without attempting to go further into the theory, its general significance for the Evolutionist may be thus stated. (1) Genes are ultimate and unchangeable. (2) Characters are combinations of genes. (3) Characters (i. e., such "combinations") though arising from a limited number of genes, may themselves be practically innumerable. (4) All diverse types which can be accounted for as the product of such "combinations" are "Evolutions" out of the primordial integral of genes which (obviously) constitutes the true species—all so-called "species" subordinate thereto, and resulting merely as diverse "combinations" of the original complex of genes, being but "varieties" of this primal type, which is the true species. (5) These primordial integrals are the *"palaeontological species"* of Neumayr—the *"natural species"* of Wasmann. (6) Any type, not so accounted for, but involving the appearance of an altogether new gene (i. e., not in the original integral) is a true "emergence," or, what is the same thing, a new creation. The truth of this last statement will gradually appear as the discussion proceeds.

So much for the current interpretation of the matter. It must now be emphasized that the role of the gene, thus described, may have no foundation in fact. Dr. Herbert S. Jennings, one of the greatest living authorities on the subject of genetics now asserts that "this theory of representative particles is gone, clean gone. Advance in the knowledge of genetics has demonstrated its falsity. Its prevalence was an illustration of the adage that a little knowledge is a dangerous thing. The doctrine is dead—though as yet, like the decapitated turtle, it is not sensible of it. It is not true that particular characteristics are in any sense represented or condensed or contained in particular unit genes. Neither eye-color, nor tallness, nor feeble-mindedness, nor any other characteristic, is a unit character in any such sense. There is indeed, no such thing as a "unit character," and it would be a step in advance if that expression should disappear." (*Vide*:*Prometheus*).

This does not mean that the fundamental idea underlying the Mendelian conception is false, but it does mean—as we hope later on to show—that the fundamental "determinants" in the germ-cell are not any order of material "micromeres" (however minute and specialized) but purely *immaterial* entities—the *meta*-physical "potentials" (i. e., potential energies) subsisting in an immaterial (mathematical) integral. In short, we propose to show in the following pages that the problem of Evolution is bound up with the problem of the Differential and Integral Calculus. It is a problem which only the philosophy of mathematics can solve.

CHAPTER II

Outline of the Theory of Evolution

(*Continued*)

BITTERLY hostile to Christianity, impatient of criticism, and undoubtedly given to exaggeration, Haeckel is, nevertheless, one of the most original, powerful, philosophical, and interesting of all the biologists. The author frankly admits that of all the writers on Evolution, Haeckel and Huxley are to him the most fascinating. Haeckel hailed with delight the appearance of the works of Darwin and Wallace, and only demurred at their unnecessary cautiousness in not boldly pressing the principle to its limits. Quickly taking advantage of the new ideas which had arisen respecting the number and character of the so-called fundamental types, he openly proclaimed his belief in the unbroken continuity of the evolutionary process throughout the whole organic kingdom. In short, he maintained that Vertebrata, Articulata (now known as Arthropoda), Mollusca, and the two great phyla into which the Radiata had been divided, viz: Echinodermata and Coelenterata, together with a further group of somewhat uncertain affinities, designated generally as Vermes, were all originally derived from the Protozoa or unicellular organisms. Of course, this system of Haeckel's was destined to undergo some revision, and minor modifications were introduced in the course of time, but there has been no change of fundamental importance in its main outlines, and it has served as the basis of most later systems of classification which adhere to a monophyletic view of Evolution. The gist of Haeckel's theory amounts to this:—Life first made its appearance in simple lumps of protoplasmic matter, devoid of definite structures and organs. These primordial cytods, or cells without nuclei, closely resembled the existing Monera—the lowest unicellular organisms. The next step in the process was the formation within these cells of a definite kernel or nucleus, such organisms being represented to-day by the Amoebae. These organisms all reproduced by the process of fission or self-division, the products of such self-division being independent organisms. In the course of time, however, there arose a stage in which these products of continued fission no longer separated as independent units, but clung together as masses or communities of cells. This stage which was eventually to give rise to multicellular individuality, but was here nothing more than a community (coenobium) of more or less independent cells, is typified in the Synamoebae. Still later, these indiscriminate masses of cells took on the appearance of "globular vesicles"—the planaead or blastaead stage, the surface cells being provided with cilia or hairlike processes which served for the locomotion of the entire colony. This stage is well represented by *Volvox* and *Magosphaera.* It should here be noticed that the original cytods were neither plant nor animal, as we understand those terms to-day, but rather combined the essential features of each. It was only after long ages of gradual differentiation that some of these cells assumed more especially animal, others more especially vegetable, functions, and thus became Protozoa and Protophyta. This differentiation continued in the coenobitic or community stage with the final result that one branch developed into the animal, the other into the plant kingdom. At the blastaead stage of development, however, the distinction is still very vague, as instanced by the fact that *Volvox* has been claimed by both botanists and zoologists for their respective departments. But to return; the next stage in the purely animal development was the "invagination" of the hollow, globular mass to form a double-layered, sacklike organism. These primeval "stomach-animals," Haeckel has called *Gastraea,* and are supposed to be the ancestors of the Porifera (sponges) and the Coelenterata (Hydrozoa and Actinozoa)—that is to say, of that entire group of cup-like organisms which consist of two cell-layers only (ectoderm and endoderm), and which, because of their strong plant-like characteristics, are often spoken of as Zoöphyta.

As the next step in the process, we find these diploblastic, sack-like organisms gradually lengthening into worm-like forms, which simultaneously develop a third, middle layer of cells (the mesoderm) and by subsequent growth differentiates a true body-cavity (coelom), distinct from the primitive stomach (archenteron); while concomitantly with the progressive elongation of the entire body, the process of segmentation sets in, with the result that the body is broken up into a series of more or less independent units, or *zooids*. We have now reached the stage represented by that confused group of organisms commonly called Vermes, or Worms, from which, it is believed, all the higher phyla of the Metazoa (Vertebrata, Arthropoda, Mollusca, and Echinodermata) have differentiated. The exact steps in this later differentiation are, indeed, very obscure, but there is considerable agreement amongst many biologists, from the evidence presented by embryology, that the ancestral form of all these higher branches of the animal kingdom was a triploblastic, coelomatic, organism, possessed of a rudimentary nervous system, and closely resembling certain existing larval forms known as *Trochophores* or *Trochospheres*. The ancestral Trochosphere—the hypothetical *Trochozoon*, as it is sometimes called—through a process of "budding," strikingly analogous to the "budding" or gemmation of the lower unicellular organisms, repeated—though on a higher and more complicated scale—a cycle of changes curiously similar to that already observed to have taken place in the transition from unicellular to multicellular life. That is to say, where this process of "budding" or "segmentation" attained more or less to completion, there resulted the formation of "colonies" or communities of zooids; where again, it was altogether incomplete, there resulted only the simple "metamerization" characteristic of nearly all the bodies of the higher Metazoa. Thus, of all the diverse forms included within the group Vermes, the organisms which are believed to resemble most closely the primitive *Trochozoon*, are the free-moving rotifers, and the lowest flat-worms, the turbellarians. In the colonial *Polyzoa*, and the strobilated *Cestodes* (tapeworms), we see the beginnings of community (colonial), and still more integrated, state life, while in the Annelids, Crustacea, and other Cormi, we witness that rapid process of consolidation which ultimately attains its limit in the metamerized, but none the less truly individuated forms of the higher Arthropoda and Vertebrata. Without attempting to enter into details, it may be said, in general, that the Mollusca (which for the most part exhibit a trochophore stage in development) are believed to have descended from this hypothetical form; the Arthropoda also to have had a similar origin, through the medium of the Annelids; while the Vertebrata (sometimes described as Chordata)* are also traced, though less clearly, through the Protochordata (including such forms as *Amphioxus*, the *Ascidians*, *Cephalodiscus*, *Balanoglossus*, etc.) to an unknown worm-like ancestor. It is of peculiar interest to note that the larval form of *Balanoglossus*, called *Tornaria*, is so strikingly like the larvae of the starfish and other echinoderms, that the common origin of these apparently far-separated groups is now postulated. However the further relations of this common ancestral form are most obscure. Generally speaking, we may say that the group Vermes is regarded as the centre of radiation from which all the higher branches of the animal kingdom have differentiated. In the line of the vertebrates the process of development continued through the fishes and amphibians to the reptiles, whence it branched into the mammals and the birds. In the class of the mammals, it proceeded, first through the egg-laying, beaked, or bird-like mammals, the Monotremata; thence through the pouched mammals, Marsupialia, to the placental mammals, Placentalia, whence finally, through the order of the Primates, it attained its apex in Man—*Homo*. According to Haeckel, it was from some now extinct branch of the man-like Apes (*Anthropoides*), somewhere toward the close of the Tertiary period, that ape-like men (*Pithecanthropi*) originated. Man, at this stage, however, was speechless (*Homo alalus*). It was not till the Quaternary period, that *true* men appeared; man possessing language, (*Homo sapiens*) developing out of the former speechless group. It may be further added that, in Haeckel's opinion, this final transition was polyphyletic, as "according to the unanimous opinion of most eminent philologists, all human languages are not derived from a common primaeval language."*

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*i. e., The vertebrates proper are really only a section of the Chordata.

To appreciate the force of Haeckel's argument, it is necessary to remember that it is built primarily upon the evidence of embryology. Taking advantage of the observation of Agassiz that every individual in the course of its ontogeny repeats, in a general way, the terms of the taxonomic series of the particular group to which it belongs, Haeckel expanded the idea so as to include the entire organic kingdom as a genetically related whole. He embodied the principle in his famous Biogenetic Law:—*"Ontogeny is a short and quick repetition, or recapitulation, of Phylogeny, determined by the laws of Inheritance and Adaptation."*§ On this principle, it was only necessary to observe carefully the successive stages undergone in the ontogeny of any individual organism, to see the entire course of the racial development spread out before us as in a miniature picture. To illustrate, we may here indicate, in a general way, the principal stages undergone by the human embryo in the course of its development in accordance with the statements of Haeckel and his school. As we shall have occasion to show, presently, a number of these stages are vehemently denied by many embryologists, and it is certain that, in his enthusiasm, Haeckel has exaggerated the detailed correspondences, but after such exaggerations are duly admitted, it still remains true that the main idea of his contention is undoubtedly substantiated. Man as all other organisms, begins his existence as a single cell,—the fertilized ovum. This stage, therefore, corresponds to the stage of such independent unicellular organisms as the monera and amoebae. The next characteristic stage in human ontogeny is the one in which this single cell, through growth and simultaneous division is metamorphosed into a cluster of cells. This is the morula stage, and corresponds to the Synamoebae. The conversion of the morula into a hollow sphere of cells ushers in the blastula stage, and corresponds phylogenetically to the Planaeads, now represented by such forms as *Volvox* and

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**History of Creation,* Vol. II., p. 294.

§*Hist. of Creation,* Vol. II, p. 33.

Magosphaera.[*] Through the process known as "invagination" this hollow ball is now converted into the diploblastic gastrula —a reminiscence of our gastraead ancestors. Between the outer and inner cell-layers (ectoderm and endoderm), there now appears a third cell-layer (mesoderm) and the embryo is thus converted into a *Triplobasticon.* Here is presented the hypothetical Trochozoon stage, and in the subsequent elongation and segmentation of this mass, with the formation of a notochord, nerve-cord, coelom, and gill-slits, we have the embryological reminiscence of those chordate ancestors which immediately preceded the vertebrates (*Balanoglossus, Ascidians, Amphioxus,* etc.) Next the embryo develops a true vertebral column, a brain of three equal divisions, a heart of two cavities only, gill-slits, Wolffian body, etc., and we have the recapitulation of the fish type. Still later, we witness the metamorphosis of the gills into lungs, the beginning of a third cavity in the heart, the modelling of a distinct head (*cephalization*), the formation of small "limb buds," and the development of a tail, and it is clear that we have reached the amphibian stage. The gills now disappear entirely, true lungs are substituted, the heart of three cavities is distinctly formed, there is a long tail, and four short limbs, and we have presented the reptile stage. Immediately after this, we meet with still further and most remarkable changes. Claw-like extremities of the limbs are noticed, a heart of four cavities is formed, the non-nucleated red blood cells (peculiar to mammals) appear, and the long milk-ridges characteristic of the mammals below man become visible. There are also indications of teeth. Here we have distinct evidence of the mammalian type as manifest below the level of Man. Then comes a semi-human form, with claw-like nails, well-developed cerebrum, — the stage of the Ape, or Ape-like Man. Finally, the tail disappears, the pectoral mammae peculiar to man and the anthropoid apes, are clearly differentiated; fingers, toes, nails, and many other features of distinctively human type are developed, and the goal toward which the entire process has been tending, now stands forth

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[*] It is claimed that the typical blastula stage (i. e., as represented in *Amphioxus*) is absent in mammals.

	PHYLOGENY	ONTOGENY	
Vertebrata	Man	Human Characteristics well-defined Hair-like Covering (lanugo) present.	From 9th week on
		Tail disappears Kidney (Metanephros) formed Ext. Genitals begin to show distinction Ovary and Testis distinguished (Heisler)	9th Week
		Fingers, toes, nails, Bladder formed Cloaca divides Wolffian body atrophies Pectoral Mammae Tail begins to disappear	8th Week
	Ape-like Man (?) Ape	Semi-human form Claw-like nails, etc. Cerebrum well developed Distinct tail	7th Week
	Mammalia (below Man)	Indication of Teeth Claw-like extremities of limbs Milk-Ridges peculiar to Mammals below Man. Heart (4 Cavities) Non-nucleated red blood cell appear. Long tail	6th Week
	Reptilia	Short limbs Heart (3 Cavities) True lungs Gills disappear	5th Week
	Amphibia	Head (Cephalization) Limb-buds Tail Heart (3 cavities-forming) Lungs (beginning) Gills (undergoing metamorphosis)	4th Week
	Pisces	Brain (3 Equal divisions) Wolffian body Heart (2 Cavities only) Gill-slits	3rd Week
Chordata	Amphioxus Ascidians Cephalodiscus Balanoglossus	Segmentation (Metamera) Coelom Notochord Nerve Cord Gill-slits	
Vermes	Rotifers; Turbellarians, etc. Trochophores (larvae) Trochozoa (Hypothetical)	Triblasticon	
Coelenterata	Hydra Gastraeads	Gastrula	
Protozoa	Magosphaera, Volvox } Planaeads Synamoebae Amoebae, Monera } Single-Cells	Blastula Morula Ovum	

fully revealed. Even after the human body has been fully formed, however, it is covered with a soft down of hair, the *lanugo,* which often persists for some time after birth.

In addition to these most remarkable embryological correspondences, and many others which might be mentioned, attention must further be called to the closely related evidence furnished by the existence of vestigial parts and organs, the recurrence, from time to time, of characters peculiar to animals remote from man (atavism), to say nothing of numberless other pathological and teratological phenomena. The brain of the microcephalous idiot, the double uterus (characteristic of the marsupials), the extra mammae peculiar to lower mammals, the phenomenon of hermaphroditism, are among these latter evidences, which might be indefinitely extended. But coming to matters more familiar, we might allude to the *appendix vermiformis*—a now useless organ—the rudiment of a formerly large extension of the caecum, characteristic to-day of many other mammals; the *pineal gland,* the atrophied remains of a singular optic nerve that once led upward to a median eye—a fact which is evidenced to-day in the discovery of the *Sphenodon,* an almost extinct species of lizard, inhabiting certain small islands off the coast of New Zealand; the *semilunar fold* or "nictitating membrane" of the eye, the remnant of a third eyelid, well developed in birds, reptiles, etc.; the small ear-tip, or projection of the helix of the human ear, which still recalls the pointed ears of lower mammals; the few, but long, and strangely persistent hairs which not infrequently emanate from this region, together with the rudiments of those muscles which once moved the ears; the rudiments also in Man of various skin-muscles which are large and functional in horses, and other animals; the *thyroid gland*—a rudiment of "the hypobranchial groove" which traverses the middle of the gill-body, and is exceedingly important in such lowly forms as *Amphioxus* and the *Ascidians;* the rudimentary hind-legs deeply buried in the body of the whale; etc. But, perhaps, the most interesting testimony of all—so far as man is concerned—is that afforded by the vein valves. The function of these valves is, obviously, to assist the action of the heart in overcoming the force of gravity, by preventing the blood which has once been pumped upward to a certain level, from falling back again. Accordingly, we find the vertical veins of quadrupeds provided with such valves, while they are altogether absent from the horizontal veins. Curiously enough, however, in the human trunk these valves exist in the horizontal, but are absent from the vertical. According to the Evolutionist, these facts are explicable only upon the assumption that man's ancestors, at one time, walked as quadrupeds, and that when once man himself learned to stand upright, and to walk erect, those veins of the trunk that were formerly vertical, now became horizontal, and vice versa.

But it is impossible in the short space at our disposal to pursue the subject further, entering into the numberless phenomena. which appear so strongly to confirm these views.

Strong as is this evidence however for the unbroken continuity of the evolutionary process from Monera up to man, and many as have been the converts to the particular monophyletic view of Haeckel, yet these conclusions have never been allowed to go unchallenged, and of late years the defection in the camp of Haeckel has become as wide-spread and as ominous as that amongst the followers of Darwin. The truth is that while the evidence afforded by embryology is undoubtedly of great weight, and the general conclusion to which such evidence points cannot be successfully denied, yet none the less Haeckel has himself materially weakened his cause by the reckless manner in which he has so often invented evidence where it does not really exist in fact. He does not hesitate to fill up the gaps in his genealogical tree with *hypothetical* forms which no man has even seen, either as living beings or fossils, and then on the basis of these creations of the imagination, he, over and over again, proclaims "the certain proof" of his conclusions. The existence of some of these forms is, indeed, more or less probable—assuming his general principle to be true (and there is also considerable direct evidence that the principle is true)—but such a procedure can never result in "the certain proof" which he claims for his interpretation. It is, at best, a plausible speculation, not a scientifically demonstrated conclusion. Moreover, within recent years, many even of the alleged "facts", upon which his reasoning is based, have been called in question, or, at least, shown to be susceptible of other interpretations, and one by one, those who have been most loyal to the theory have begun to shift ground, until at the present hour we find no inconsiderable number who have abandoned it altogether. Thus even so radical a materialist and admirer of Haeckel as Carl Vogt, says of the "Law of Biogenesis"—"This law which I long held as well-founded, *is absolutely and radically false.*" Prof. Morgan also asserts that it is "*in principle, false.*" Oskar Hertwig, one of the most famous of Haeckel's own pupils, admits that there is "a contradiction contained in it," which will have to "be removed," and in further explaining his meaning, shows clearly that he has abandoned it altogether. His, the distinguished embryologist, has pointed out that the recapitulation of the different types presented in ontogeny, by no means necessarily implies genetic connection; while the further adverse criticisms of Fleischmann, Reinke, Oppel, Wasmann, Beard, Hensen, Emery, Driesch, and others, have pretty well demolished the idea that it must be accepted as a scientific certainty.

But this is not all. Not only has the validity of the Biogenetic Law, as expounded by Haeckel, been thus seriously undermined, but many other considerations have combined with this reaction to encourage a polyphyletic, rather than a monophyletic, view of the evolutionary process. Chief among these further considerations has been the utter failure of Evolutionists to agree on any one monophyletic system; the increasing tendency to divide the animal kingdom into natural groups which appear to have no genetic connection whatever; the total absence of the intermediate links which the Darwinian theory demands; the general breaking down of this last interpretation in favour of some form of "mutation", or theory of "multiple origins"; the evident agreement of the palaeontological record with theories of this latter kind; and the growing conviction amongst many embryologists, that the egg-cells of various animals, while superficially alike in many respects, are really fundamentally different—i. e., *different in kind.* Wigand of Marburg and Reinke of Kiel have long been known to entertain such polyphyletic opinions—"Wigand assumed for his origin of each species a special primitive cell and a long phylogenetic development of this; Reinke prefers a stem composed of a number of species."* It is this last conclusion also to which Oskar Hertwig has come. He contends that the egg-cells of mammals differ essentially from those of reptiles and Amphibia; while all of these again differ fundamentally from the single-cell Protozoa, so that the possibility of any of these groups being genetically connected, and a monophyletic system of Evolution thereby established, is out of the question. Steinmann, of Freiburg, has taken similar ground, repudiating the family-tree of Haeckel altogether, and insisting that no such scheme can be made to fit in with the palaeontological record. As a consequence, he contends for the principle of "multiple origins". According to him, even the class of mammals is polyphyletic in origin—apparently endorsing the already widespread speculation that the Monotremata, Marsupialia, and Placentalia are descended from three distinct sources. But to realize how rapidly the idea of polyphyletic evolution has grown in favour, we have only to quote the following statement of Dennert. "Fleischmann establishes the fact that in the animal kingdom *there are rigidly separated types, which cannot be derived from each other,* whereas the doctrine of descent postulates 'one single common model of body-structure' from which all types have been developed. Cuvier in his day set up four such types of essentially different structure; when Darwin's work appeared, two more had been added; R. Hertwig postulates even seven, Boas nine (both 1900); J. Kennell (1893) seventeen, and Fleischmann himself sixteen. In consequence the doctrine of descent has become more complicated since it now embraces sixteen or seventeen different problems, each of which, in turn, gives rise to many subordinate problems."§ It may be added that Claus, Hamann, Theodor Boveri, R. von Wettstein, Koken, Wasmann—all advocate similar opinions. Of all these, Fleischmann has more than any other, astounded the advocates of monophyletic descent by the cogency of his objec-

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*Haeckel—*Wonders of Life*, p. 337.

§*At the Deathbed of Darwinism*, pp. 124, 125.

tions. Among other things, he attacks the postulate that the four higher classes of vertebrates (Amphibia, Reptiles, Birds, Mammals) have descended from the fish; severely criticizes the "parade-horse" theory of Marsh; and points out that even according to the views expressed by "Marsh, Dames, Vetter, Parker, Tuerbringen, Pavlov, and Mehnert, it is inadmissible to connect birds with a definite class of reptiles."* He also critically examines the "roots of the mammal stock," "the origin of lung-breathing vertebrates," the "real phylo-genetic problem of the mollusks," and "the origin of the Echinodermata."** Here also we must consider the polyphyletic interpretations of Neumayr and Wasmann, based upon the conception of "palaeontological" or "natural" species, as opposed to "systematic species"— an interpretation which cannot be emphasized too strongly. To understand this view, we must observe that "Geoffry Saint-Hilaire, as is stated in his *Life*, written by his son, suspected as early as 1795, that what we call species, are various *degenerations of the same type.*"§ Owen also expressed a similar opinion. Again, as early as 1857, McCrady suggested the possibility that species themselves might undergo a development of their own.† That just as "the individual of any species was not the same in form at all periods of its existence, but exhibited form-changes. . .a progressive morphology," so might each species "exhibit, in the course of its history, a cycle of changes belonging to itself, and included in its original conception." It appears also that Neumayr maintained a similar opinion many years ago, denominating such a "series of forms, connected phylogenetically by descent"—"a palaeontological species".

The essential idea running through all these interpretations (and which we may further remark parenthetically, is based largely upon the embryological evidence of "recapitulation",) has been summarized in Otto's *Naturalism and Religion* (pp. 143-145), and is admirably condensed by Micou, in the follow-

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*Id. pp. 125-127.
**Id. p. 127.
§Darwin, *Origin of Species*, Introduction.
†Proceedings of Elliott Society, pp. 222, 223. Address delivered at Charleston, S. C., May 15, 1857.

ing statement:—"An interesting suggestion arises from this recapitulation theory, that the whole process of Evolution may be embryological, and each species a continuous line of life, the successive forms being transient, *larval* stages in the predetermined growth. On this view, each true species forms, as it were, an individual organism, whose life is measured by ages, and it passes through successive forms, corresponding to the larvae of a frog or butterfly, save that these forms propagate themselves, decided changes taking place at certain stages through the inner genetic force, in relation to the environment, but not determined by it. This view is a far cry from Darwinism, yet one great school of Evolutionists is to-day insisting on it. Many men with their own special theories make up this school, but in general the following is a summary of their position. To them variation seems to have taken place by leaps and bounds, with relatively sudden transformations of the functional and structural equilibrium on a large scale . . . This saltatory kind of Evolution-process is neatly called *'kaleidoscopic variation'*, because as the pictures in a kaleidoscope change not gradually, but by a sudden leap to an essentially new pattern, so also do the forms of life. . .Variation seems predetermined and in a definite direction—an 'Orthogenesis' in fact," etc.*

Wasmann has now elaborated this idea in his *Modern Biology and the Theory of Evolution,* especially emphasizing the evidence for such "natural species" within the sphere of entomology, wherein he is a recognized master. Says he, "the systematic species of the present time do not represent the originally created forms, but are the result of a process of Evolution, uniting the species of the present and the past in natural series of forms, the members of which are related to one another, and each of which points back to an original primitive form, whence it is derived. If we designate each of these independent series of forms, yet related to other series or families, as a natural species, we can still assent to Linnaeus's dictum: *Tot species numeramus, quot diversae formae in principio sunt creatae.* We reckon so many natural species as there were different prim-

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**Basic Ideas in Religion,* pp. 83, 84.

itive forms created in the beginning. Each of these natural species has in the course of evolution differentiated itself into more or less systematic species. How many systematic species, genera, and families belong to a natural species cannot yet be stated with certainty in most cases. Still less are we able to say how many natural species there are, i. e., how many lines of ancestry independent of one another. We must leave the decision to the phylogenetic research of future ages, if indeed it ever succeeds in arriving at one."* Elsewhere he defines his view as follows: "We must class together definite series of systematic species, which probably are of common origin, as forming one natural species, and trace them back to one primitive form. If we wish to account for the origin of these primitive forms, we must have recourse to the old doctrine of Creation and say: 'The natural species were originally, in their primitive forms, produced by God directly out of matter.' "** This view, he explains, preserves the idea of a genuine Evolution, but in *independent lines,* each originating from an independent source (Polyphyletic Evolution).

In illustration of the principle, he says,—"If we consider the numerous genera and species of Ants from the earliest Jurassic period to the present day, we can hardly doubt that they are offshoots of one single natural species, and are not several natural species. The same remark applies to the family of Termites, with its great variety of fossil and still existent genera and species."§ Again, "Among molluscs, the Ammonites may be mentioned as a group of forms very rich in systematic families, genera, and species; they can be traced from the Devonian to the Cretaceous period through a long series of geological strata, as a uniform, close line of forms, that we must reckon as belonging to one natural species, not many."† We cannot follow his particular views farther, but he sums up the general situation to-day by saying:—"The following points may be regarded as settled with regard to the scientific aspect of a hypothetical race-evolution: (a) There is no scientific

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***Modern Biology and the Theory of Evolution,* pp. 296, 297.
**Id. p. 428.
§Id. p. 298.
†Id. p. 299.

evidence at all in support of a monophyletic origin of all living things from one single primitive cell; (b) A monophyletic evolution of the animal kingdom on the one hand, and of the vegetable kingdom on the other, appears very improbable, when the results of palaeontological research are taken into consideration; but the scientific evidence in favour of a polyphyletic evolution of animals and plants is steadily gaining weight. We may therefore accept the polyphyletic evolution of both animals and plants from the standpoint of both biology and palaeontology alike; but the number of the various lines of descent, and the extent of each, are still very obscure." Like Wallace and Mivart, Wasmann believes the spiritual nature of man to be the result of a distinct act of Creation, and the being resulting from this "inbreathing" of the Divine Spirit into Matter represents, in consequence, the origin of an altogether *new cycle of Evolution.*

In this sense, therefore, even these older authorities (i. e., Wallace and Mivart) must be ranked among the polyphyletic Evolutionists. Whether the bodily nature of man has been directly evolved from some lower animal, as Wallace supposes, or whether, on the other hand, it was formed directly out of the elements of inorganic matter (the traditional view), Wasmann is unwilling to say. In either case, however, he sees nothing to contradict the general statement of Genesis II. 7. With him it is simply a matter of evidence, which view is to be taken, but— contrary to a wide-spread, but erroneous impression— Wasmann realizes that conclusive scientific evidence even for the derivation of man's body from a lower animal form, is distinctly wanting. The *possibility* of such an origin (which Wasmann is far from questioning) has been talked about, dreamed about, written about, to such an extent that it has now come to be regarded as a demonstrated fact. This is the general impression among the mass of non-scientific men and women, who are, unfortunately, too often led to these conclusions by men of considerable prominence whose conscientious belief in a theory has outweighed the just appraisal and statement of the *facts;* and also the vast amount of pseudo-scientific literature disseminated in the magazines and newspapers, to say nothing of such entertaining romances as H. G. Wells' *Outline of History*. The "missing link" between man and ape, or man and any other animal, has never been discovered, though the search has been diligently carried on for years. We may laugh at Haeckel's family-tree, but this long sought creature, whose existence has been so positively asserted, is as absolutely unknown to us as Haeckel's *Gastraeads*. It is a creature of the imagination solely, invented to fill up an all too conspicuous gap. Remember, we do not say that such a creature did not exist; we only say that, if he did, we have, nevertheless, been unable to discover him up to date, and until he has been discovered, it is ridiculously false to assert that the theory has been proved. This is the very point *to be* proved—not to be taken for granted as a fact—if the Darwinian and similar interpretations of Evolution are to be justified; and it is just this evidence, so necessary to establish the theory, that is (up to date) entirely wanting.

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*See NOTE B at end of this chapter.

In saying this we are not unmindful of the fact that much evidence of a circumstantial character, strongly tending to suggest genetic connection between man and animal has been collected, and so impressive is the net result, that a majority of scientists openly avow their belief in such a derivation, with the natural result that the public generally accept their opinion as final; but it is equally as true that there is also (as we shall presently see) a vast amount of circumstantial evidence pointing to a very different conclusion. Moreover, there is also a vast amount of circumstantial evidence tending to confirm the monophyletic pedigree of the entire animal kingdom, as set forth by Haeckel, and this, too, has been very generally accepted by the public as the final verdict of science, despite the fact (already pointed out) that such a "pedigree" is by no means universally endorsed by biologists to-day. Nay, more; not only has the validity of the Biogenetic Law been attacked from a number of different angles, but specifically in regard to its bearing upon this very question as to the origin of man. As Wasmann cogently remarks:—"The resemblances between the human embryo and that of other vertebrates are so superficial that His, W. von Bischof, and even Karl Vogt, and many other recent and thorough students of comparative embryology, have protested against Haeckel's regarding these resemblances as phylogenetically significant identities. Nothing but gross want of knowledge can excuse a man at the present day for bringing forward this *argumentum ex ignorantia* in support of this descent of man from beasts."* Nor must it be forgotten that even the evidence accruing from the many structural resemblances between man and the higher mammals can frequently be explained upon the principle of "Convergence," so altogether eliminating the principle of common descent. Even Wiedersheim was careful to warn his over zealous colleagues of this fact many years ago,§ and we understand that Dr. H. Friedmann has further elaborated the thought in his *Die Konvergenz der Organismen.*

While, therefore, we have great respect for the long array of names that from the days of Darwin have clung to this opinion, and the admirable contributions to the subject which have been added in recent years by Sir Arthur Keith, and many others, yet after all is said and done, the actual evidence for man's descent from the brute remains circumstantial only, and not only is this circumstantial evidence offset to a large extent with evidence of a contrary character, but, in itself, is by no means in all cases beyond criticism. Indeed, Prof. Osborn, who is one of the foremost authorities upon the subject, and whose *Men of the Old Stone Age* is a most fascinating presentation of all that is fairly well known regarding the life and works of early man, is now confident that man has not descended from either apes or monkeys, "but that *he has a long and independent line of ascent of his own.*"† It is only to the so-called Trinil Man (*Pithecanthropus erectus*) that we can look with any hope of settling the question, and here, unfortunately, agreement amongst authorities is impossible. For a while, the surmises of its discoverer DuBois, were warmly and enthusiastically received, but later investigation resulted in a decided reaction against this conclusion, until to-day, in the opinion of

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***Modern Biology*, p. 455.

§*The Structure of Man*, Preface, p. vi.

†See NOTE A. at end of Chapter.

some of the foremost authorities, "he ceases to be a witness in support of the theory of man's descent from beast." "The fragments were regarded by some," says R. Hertwig, "as belonging to a connecting link between apes and man. . .By others they were thought to be the remains of genuine apes, and by others again to be those of genuine men. The opinion that is most probably correct is that the fragments belonged to an anthropomorphic ape of extraordinary size," etc.*

With such disagreement even among experts (many of them, too, very partial to the theory) it is obvious that no certain conclusion can be drawn respecting *Pithecanthropus*, much less one of so weighty importance, and beset with so many other difficulties, as that in question. To reason from this one isolated specimen (for there are no others), whose remains are so scanty and fragmentary that specialists themselves cannot agree as to their real character, to the certain and infallible conclusion that they represent an entire race of creatures, completely filling the gap between animal and man, and so solving the long debated problem forever, is preposterous. Wasmann is certainly justified when (citing the contention of Virchow) he affirms —"it is nothing short of an outrage upon truth to represent scanty remains, the origin of which is so uncertain as that of *Pithecanthropus*, as absolute proof of the descent of man from beasts, in order to deceive the general public."§ Such a conclusion is, at best, nothing more than a more or less plausible speculation. It can never logically be regarded as a scientifically established fact. As a mere theory, it is perfectly possible; it may even be probable; but it *can never be certain.* And it is only as such a scientific certainty; loudly proclaimed as beyond all reasonable doubt, and countenancing no rival opinions, whether scientific, philosophic, or religious, that we are here criticising it. We have no personal prejudices against it, as a

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***Modern Biology*, p. 465.

§*Lehrbuch der Zoologie.* Furthermore the geological date of the remains has been seriously questioned. "More recent investigations made in Java by Voltz and Elbert have transferred the ape-man into the Pleistocene epoch, and as Branco stated in 1908, he probably lived about the middle of it, and hence he could not have been an ancestor of man, as he was a contemporary of man at that time." (Wasmann, *Modern Biology*, p. 505.)

theory, for not only is it easily reconcilable with our own theological and other opinions, but, as a matter of fact, if we could only know it to be true, it would clear up sundry difficulties. But we do not *know* it to be true, and all this over-confidence displayed by its proponents, while steadily keeping from the public the many serious objections that have been urged by equally as eminent authority against many of the alleged "facts" in the case, can only weaken, rather than strengthen, the cause with all thoughtful men. In short, we must squarely face the fact that here, we are in the domain of speculation only.

The words of Virchow, uttered years ago at the Twentieth Congress of the German Anthropological Association, continue true at this hour:—"In vain have its (Darwinism's) adherents sought for connecting links which should connect man with the monkey. Not a single one has been found. This so-called *Proanthropus* which is supposed to represent this connecting link has not appeared. No true scientist claims to have seen him." Prof. W. Branco, Director of the Geological and Palaeontological Institute of the Berlin University, in his address before the Fifth International Congress of Zoologists, squarely asserts—"Palaeontology tells us nothing on the subject—it knows no ancestors of man." "The only statement, consistent with her dignity that science can make," declares Reinke, "is to say that she knows nothing about the origin of man." So also Wasmann:—"Not one connecting link has been found between their hypothetical ancestral form and man of the present time: the whole hypothetical pedigree of man is not supported by a single fossil genus or a single fossil species."* We might continue such quotations indefinitely. To understand the real situation to-day, it is necessary to remark that there are two very diverse opinions entertained respecting the origin of man. The one holds that man is directly related to the ape; the other denies such direct connection, but holds that both man and ape are descended from a hypothetical common stock —a remote ancestor who lived at the beginning of the Tertiary, or perhaps in the Pre-Tertiary period. The former of these

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**Modern Biology*, etc. p. 464.

views is based mainly upon the many striking, structural peculiarities common to man and ape, which have so often been remarked upon; the discovery of Selenka that the higher apes further resemble man in their embryological development by the possession of a simple discoid placenta; and the further apparently convincing evidence adduced by Dr. Hans Friedenthal in his famous blood-test. However, the complete breaking down of Friedenthal's experiment in so far as it is supposed to determine genetic relation, together with the many equally as striking structural differences between man and ape, and the failure of palaeontology to furnish any intermediate forms, etc.,—all these have weighed heavily against the theory. As regards the failure of Friedenthal's test, we do not mean that the principle enunciated as to a specific chemical constitution of the blood is incorrect, but only that it has no necessary connection with *genetic relationship*, as was formerly supposed. Just as it is well known that each species of plant and animal has a definite number of chromosomes, but agreement in number does not imply genetic relationship—the armadillo and the horse, for example, having 60 each, while the bat, the hedgehog, and man agree in having 48. Moreover, if the very feeble reaction observed between the blood of man and ape is to be interpreted as an infallible sign of consanguinity, we shall also be compelled to conclude that a like close relationship exists between goats, sheep, horses, and men, for the reactions here involved are notoriously weak. The truth is the whole problem underlying Antigen, Amboceptor, and Complement is still more or less shrouded in mystery, and while pathologically the principle has proved of great value in the detection and treatment of disease, it appears to have no certain significance regarding genetic relationship, and is of no value whatever as evidence in the problem here under consideration.* Indeed, it is just

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*It appears that Friedenthal himself repudiated this popular interpretation of his experiments. He publicly declared that "in using the word, 'blood-relationship', he had never meant anything more than a blood resemblance in the chemico-physiological sense. It was a mistake on the part of writers on popular science to say that by blood-relationship he understood actual kinship, and he protested energetically against having such an idea imputed to him." (See Wasmann—"*Modern Biology*"—p. 503).

these difficulties, which when added to the equally striking differences which exist between man and ape, render the opinions held by Klaatsch, Alsberg, Stratz, and others, of supreme importance. Of these great differences (we are not speaking now of mental, but of *structural, anatomical differences*) the general public hears little. It is only the resemblances that are stressed in the popular literature on the subject. Yet so striking are some of these divergences between man and ape, that the advocates of this latter theory candidly admit the contention of Ranke, Virchow, Kollmann, and others that these two groups must be considered as representing "*two distinct lines* of Evolution among mammals, diverging widely at their extremities." "That man is directly descended from apes, is inconceivable," asserts Klaatsch, "and it is possible to speak of relationship existing between man and ape only in so far as both are ultimately connected at the root of their common genealogical tree, *and this applies to all mammals.*"* But, if this be true, it seriously diminishes the force of much that has hitherto been heralded as the strongest evidence the Evolutionist has of man's close kinship with the brute. Indeed, if these most remarkable resemblances between man and ape—these very phenomena which have hitherto been regarded as the most convincing evidence we have of a close relationship between the two—are now to be altogether abandoned as proof of such close relationship, and refuge is to be taken in the hypothesis of some very remote connection only, in some early Eocene mammal (neither ape nor man), it is obvious that we are surrendering half the argument hitherto advanced by Evolutionists in support of their theory, and if, with this evidence removed, we are to justify that theory at all, it is manifest that palaeontology must actually discover this hypothetical synthetic type in the early Tertiary, and simultaneously furnish a reasonable number of intermediate ancestral forms, in both lines of descent, leading upward thereto.

Now, up to this present moment, Palaeontology has been able to do neither of these things. No such synthetic type has ever been discovered, and no intermediate ancestral forms indicating

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*Wasmann—*Modern Biology*, etc., p. 463.

a gradual convergence of the two lines of descent, have been brought to light. The utmost that can be said in favour of such a remote connection is that many authorities, for years past, have insisted that the antiquity of the human race is far greater than the majority of scientists themselves have been willing to admit. It is only right to say that numbers of eminent anthropologists, geologists, and other scientists,—men like Mortillet, Quatrefages, Berthoud, Abbé Bourgeois, Rames, Cappellini, Ragazzoni, Ribiero, Topinard, Prof. J. D. Whitney, Lenormant, Alfred Russell Wallace, *et al.*—once earnestly contended for the existence of Tertiary Man, on the grounds of alleged discoveries of genuine human remains both in the Pliocene and even in the Miocene, and further insisted upon the existence of cultural and other relics, indicative of man's existence, as associated therewith, and it is difficult to understand how testimony of this kind, furnished by so many competent authorities, can be so generally disregarded. For one reason or another, however, this evidence has hitherto been generally repudiated by the scientific world, and is now only partially accepted in the recent tendency to admit that a few crude eoliths of the late Pliocene, are probably of human origin.* Speaking broadly, we may say that the general attitude to-day is decidedly sceptical in regard to Rutot's Eolithic theory, and is frankly hostile to any alleged discoveries of actual human remains anywhere in the Tertiary. It is manifestly partial, on the other hand, to any alleged *semi*-human (*i. e.*, ape-like) remains, however meagre and imaginary these may be. The reason for this is obvious. The farther back we trace the existence of man as man—*i. e.*, as a fully developed species, altogether distinguished from the ape—the less does such evidence spell Evolution *from the ape.* The lines should converge rapidly after we enter the Tertiary; genuinely human fossils should gradually take on more and more ape-like features, becoming semi-human, until finally, far down—possibly in the Oligocene—we should see the human

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*"There is now however no longer any doubt about man-made eoliths and evidence of man-made fires occurring in the Upper Pliocene strata of Southeastern England (Foxhall, Ipswich, Suffolk). Younger eoliths, of the First Glacial time, occur at Cromer, Norfolk. These are older than the oldest known human bones." (Pirsson and Schuchert, *Text-Book of Geology,* Part II. p. 674).

line merge with that of the ape. There is nothing to be gained, therefore, by the discovery of genuine human remains—the unchanged species—so far down in the scale, for while such a discovery would not necessarily disprove the Evolution theory as such, it would strongly tend to disprove that interpretation of the theory which maintains man's descent from an ape-like ancestor, and would simultaneously render the proof of any kind of human Evolution from the animal that much more difficult.

We can, therefore, fully understand the protest of Schwalbe against any and all theories which would seek the origin of man in such a remote geological period. "I cannot but regard this hypothesis as lamentably retrograde," says he, "for it makes impossible any application of the facts that have been discovered in the course of the anatomical and embryological study of man and monkeys, and indeed prejudges investigations of that class as pointless. The whole is perverted; an unjustifiable theory of descent is first formulated with the aid of the imagination, and then we are asked to declare that all structural relations between man and monkeys, and between the different groups of the latter, are valueless,—*the fact being that they are the only true basis on which the genealogical tree can be constructed.*"* If this view must be abandoned, then, and all the alleged evidence as to true human remains in the Tertiary be given up, palaeontology must come to the rescue and supply us with the necessary intermediate forms; but—alas, there are no such forms. Nay, more! The significant fact is, declares Wasmann, that "we have the pedigree of the present apes, a pedigree very rich in species, and coming down from the hypothetical ancestral form of the oldest Tertiary period to the present day. Zittel's *Grundzuge der Palaontologie* gives a list of no fewer than thirty genera of fossil Pro-simiae, and eighteen genera of fossil apes, the remains of which are buried in the various strata from the lower Eocene to the close of the Alluvial epoch, but not one connecting link has been found between their hypothetical ancestral form and man of the present time.

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*"The Descent of Man," in collection of articles entitled *Evolution in Modern Thought*, p. 142.

	YEARS			
PLEISTOCENE OR GLACIAL	10,000	Neolithic		Modern Races
	25,000	Azilian-Tardenoisian	Upper Paleolithic	Cro-Magnon
	50,000	Magdelenian		Neanderthal
	75,000	Solutrean Aurignacian		
	100,00			
	125,000	Mousterian	Lower Paleolithic	
	150,000	Achulean		
	175,000	Chellean		Piltdown
	200,000	Pre-Chellean		
	225,000			
	250,000			
	275,000			
	300,000			
	325,000			
	350,000			Heidelberg (?)
	375,000			
	400,000			
	425,000			
	450,000			
	475,000			
	500,000			(Pithecanthropus (?)
PLIOCENE				(" " " ?)*

*It is to be noted that aside from the questionable character of the remains of *Pithecanthropus*, authorities have differed in their estimates of the geological age of the fossil all the way from the supposition that it belongs to the late Pliocene or early Pleistocene, to the assumption that it should be assigned to the middle of the Glacial period—and so contemporaneous with Heidelberg Man (unless he, in turn, is to be brought still nearer to our own time—a supposition which also has its supporters).

CHART of the ANTIQUITY OF MAN

The whole hypothetical pedigree of man is not supported by a single fossil genus or a single fossil species.”[*] In short, the two lines, acknowledged to be far apart at their present extremities, break off abruptly before we even reach the Tertiary, and from there on back, while the line of apes continues, there is no trace of man. This means that as far back as we can trace him at all, man is a creature widely distinct from an ape.

We repeat: the famous *Pithecanthropus erectus,* upon which the hopes of the Darwinian school of Evolutionists were so confidently fixed (but whose scanty remains only furnished a problem, rather than a solution) no longer figures seriously in the matter. At the time of its discovery Virchow warned the scientific world of the danger of attempting to draw any certain conclusion from evidence so meagre and conflicting as was then presented, and the subsequent history of the controversy has fully justified the scepticism of the great anatomist. Even Schwalbe declares now that he (*Pithecanthropus erectus*) “has no place in the genealogical line of man’s direct ancestors”,[§] and concurs in the opinion of Klaatsch, R. Hertwig, Alsberg, and others, that “he ceases to be a witness in support of the theory of man’s descent from beast.” With this claimant for the honor so disposed of, there are no other fossil forms to be considered, for *Homo primigenius* (Neanderthal Man) — as the name reveals—is not ancestral to, but well within the human species and is now very generally regarded as a sub-species of man, diverging coincidently with existing races of men, from some older form of *Homo,* now altogether unknown to us; while of such alleged “races” as Piltdown and Heidelberg Man, nothing really is known. The evidence afforded by the single jaw bone discovered near Heidelberg—a jaw somewhat ape-like in formation, but with all the teeth distinctly human—is obviously too insignificant to warrant any scientific conclusion as to its real significance—especially the conclusion that it demonstrates the existence of a whole “race” of individuals half-way between apes and men:* while the equally scanty remains discovered at Piltdown, England,—remains which have been regarded with suspicion by many of the foremost authorities—are again, quite as obviously, open to the same criticism. With Klaatsch, Schwalbe, Macnamara, Hertwig, Branco, Lankester, G. S. Miller, Waterston, Hrdlicka, and MacCurdy, all passing adverse judgments upon the reliability of the Piltdown evidence, it is difficult to understand how it can be so confidently proffered to the public as "scientific demonstration" of man's descent from the ape! ! All this is speculation pure and simple.§ In short, when we come down to the hard rock of actual scientific evidence—eliminating all possible, but as yet undemonstrated theories—we find ourselves merely repeating the words of Prof. W. Branco—uttered as long ago as 1901 in his famous address before the Fifth International Congress of Zoologists at Berlin. As reported by Wasmann, the gist of the testimony there presented by the well known Director of the Geological and Palaeontological Institute, was as follows:—"In the history of our planet man appears as a genuine *Homo novus*. It is possible to trace the ancestry of most of our present mammals among the fossils of the Tertiary period, but man appears suddenly in the Quaternary period, and has no Tertiary ancestors, as far as we know. Human remains of the Tertiary period have not yet been discovered, and the traces of human activity, which have been referred to that period, are of a very doubtful nature, but diluvial remains abound. Man of the diluvial epoch, however, appears at once as a complete *Homo sapiens.* Most of the earliest human beings possessed a cranium of which any of us might be proud. They had neither excessively long, ape-like arms, nor excessively long, ape-like canine teeth, but *were genuine men from head to foot.*"*

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[*] *Modern Biology,* p. 464.

[§] Vergeschichte des Menchen, p. 29.

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*As a matter of fact Kramberger, Klaatsch, et. al., have now thoroughly exploded the idea that the Heidelberg jaw can be attributed to any ape-like, semi-human ancestor of man bv showing that it "belonged to a man of Neanderthal type". This is now a very widely accepted opinion, and coupled with the further fact that an Eskimo skull in the Munich Institute for Palaeontology possesses "exactly the same features"—the conclusion that it is the remains of a genuine human being appears to beyond dispute. With the Trinil, Piltdown and Heidelberg remains eliminated as evidence, and the recently discovered fossil of Rhodesian Man declared now to be thoroughly human and not "nearly so old as Neanderthal Man," it is obvious that there is not a single specimen that can be adduced as proof of the existence of such pre-human, ape-like ancestors of man.

†Professor Osborn tells us (*Science*, Feb. 22, 1929, pp. 216, 217) that "it now seems almost certain that *Pithecanthropus* is of Middle Pleistocene Age," while *Eoanthropus* is still older: though whether from the "Upper Pliocene" or the "Lower Pleistocene" it is impossible to determine. Beyond, therefore a further confirmation of the conclusion that *Pithecanthropus* can no longer be regarded as ancestral to man, this latest evidence throws no definite light upon the problem.

But while it is thus ridiculously false to assert, as Haeckel and so many others do, that the descent of man from the ape, or an ape-like ancestor, has been scientifically established (!) as a "certain historical fact" (!), and while advocates for such an origin are only weakening their cause by such preposterous asseverations, as well as by their futile attempts to belittle the wide palaeontological gap that so obviously exists, yet—as we have already said—in spite of all this adverse evidence—the *possibility* of such a bodily origin, must not be disregarded. Once more, let us distinctly assert, we have no theological axe to grind in assuming the position we have, for, as we propose to show in a subsequent chapter, the actual derivation of man's body from the brute, is as easily reconcilable with our own theology, as is the assumption of its separate and special creation. It may ultimately be proved that such derivation is a fact, and we ourselves will cheerfully accept the proof when it is forthcoming. As matters now stand, however, we distinctly deny that any such "proof" exists, and science must be willing squarely to acknowledge that the evolution of man's body from the brute is a theory only, and *in no sense of the word a scientifically demonstrated fact.* So far is it from being a scientific certainty, we must freely acknowledge that palaeontology has been provokingly slow in yielding any really reliable and convincing evidence in favor of the theory, and what evidence there is, taken as a whole, is distinctly adverse to the Darwinian interpretation of the matter. When once we freely admit these facts, however,—when once we duly acknowledge the reality and the magnitude of the "gap" so conspicuously evidenced by the geological record—we may (as long as that gap continues unfilled) contemplate the possibility of another interpretation. It should never be forgotten that it is just such cases, wherein we are confronted with undeniable "breaks" in the record—the total absence of transitional forms, the sudden appearance of altogether new characters, etc., that the theory of mutations so admirably accounts for. Under the circumstances, therefore, it would not be at all impossible that such a mutation may have taken place in the case of man. This seems to be the view of Prof. J. Arthur Thomson, who in his recent work, *Concerning Evolution,* remarks:—"Mutations often occur in Nature, transilient or discontinuous variations. It is probable that man arose as a mutation." (*Id.* p. 238). We shall have occasion to refer to this subject again in the ensuing chapter, especially in connection with Lloyd Morgan's theory of Emergent Evolution. In concluding the present sketch of the Evolution theory, we may remark that apart from this last mentioned hypothesis, the most significant signs of the times are, the general reaction against Darwinism, the search for new, "internal" factors, resident in the germ plasm, the rise of the new school of genetics, the increasing belief in orthogenesis or definitely directed evolution, and in some form of so-called dis-continuous Evolution (Mutation) and the closely related views concerning multiple origins, *i. e.,* polyphyletic as opposed to monophyletic Evolution. The present status in regard to this last tendency cannot be better summarized than in the words of Wasmann already quoted: "The following points may be regarded as settled with regard to the scientific aspect of a hypothetical race-evolution: (*a*) There is no scientific evidence at all in support of a monophyletic origin of all living things from one single primitive cell; (*b*) A monophyletic evolution of the animal kingdom on the one hand, and of the vegetable kingdom on the other, appears very improbable, when the results of palaeontological research are taken into consideration; but the scientific evidence in favour of a polyphyletic evolution of animals and plants is steadily gaining weight. We may, therefore, accept the polyphyletic evolution of both animals and plants from the standpoint of biology and palaeontology alike; but the number of the various lines of descent and the extent of each are still obscure."*

**Modern Biology,* pp. 477, 478.

**Modern Biology,* p. 303.

NOTE A.

Besides maintaining that the mathematical and artistic faculties of man can not be accounted for "by purely evolutionary processes," and hence must, in some sense, be attributed to the creative operation of an extra-developmental Power, it appears that Prof. Osborn has joined the ranks of those who deny the descent of man from either ape or monkey, assuming for him a long and independent line of his own, embodying human and pre-human stages, and so only remotely connected with an animal ancestry. This view which follows closely the lead of Klaatsch, Alsberg, Stratz, *et al.,* (however it may differ as to details) is doubtless an important advance in the right direction, but nevertheless an unfortunate step for Evolutionists of the old school to be forced to take. For while, as we have already said, it does not preclude the possibility of an Evolution from some lower animal form, it virtually admits the necessity for surrendering the original, and generally received interpretation of the matter; and by placing the point of origin immeasurably farther back in a remote geological past, where evidence either *pro* or *con* is impossible, renders the whole theory doubly questionable. It was the marked *structural resemblance* between ape and man that constituted the very essence of the original argument for a close genetic relationship which Evolutionists did not hesitate to assert would be vindicated by the discovery of a number of true, intermediate forms or "Missing Links" completely filling up the gap in the chain. Now that these "Missing Links" are not forthcoming—now that palaeontologists have failed to find any such intermediate forms—have been forced to admit that geology knows no pre-human or pithecoid ancestors of man, but that as far back as we can trace him, man is distinctly *man* —human—appearing abruptly as such upon the scene—there is, of course, nothing for the Evolutionists to do but to put the "connection" still further back—indeed, immeasurably further.

In short, because all the evidence we confidently expected to find, has signally failed, and the very antiquity of the human race has only added emphasis to the apparent *independence* of the two lines, there is now nothing to be done—if their common origin is to be defended at all—but to place it immeasurably farther back in the unknown geological past. This is well, if their common origin is to be defended at all; but who knows now that it can be defended at all, as a necessary assumption? There is now no more evidence for it than there is against it. So far as the palaeontological record is concerned, what evidence there is, proves neither creation nor descent. It is simply *an open question,* more or less unfortunate for the Evolutionist, inasmuch as he anticipated the discovery of positive geological evidence to support his side of the matter, which evidence he has failed to find, and (because of other, unexpected facts) he has even been forced radically to revise his whole position, if it is to be defended as a possibility at all. But even as matters now stand, it remains a "possibility" only, with *less* evidence than was formerly believed.

The actual statements of Prof. Osborn, as well as those attributed to him by the press, are as follows:—"With clarion voice these irrefutable witnesses of our past positively demonstrate two new and somewhat unexpected truths: first, that *man has not descended from any known kind of monkey or ape, fossil or recent.* With this truth established. . .one of the chief sentimental objections to the creative Evolution of man disappears forever. Second, man has a long, independent, superior line of ascent of his own, with a relatively erect posture, with hands free to grasp and use tools," etc. (*The Earth speaks to Bryan,* p. 10.) In his Ithaca Address, as reported by the Associated Press his position is thus further defined:—"The outstanding irrefutable facts," he said, are the following:—

"First, that man with a human form and human attributes has been on earth over 500,000 years, according to the least estimates of geological time.

"Second, that man belongs to a family of his own, called the *Hominidae* which has a history entirely independent of all other families for an incalculable period of time—2,500,000 years at the least geological estimate.

"Third, that this human and pre-human family, composed of the existing and prehistoric races of man, has been from the first divided into many branches more or less rapidly progressive and intelligent.

"Fourth, that we have indisputable records of the early dispersal of these branches in Central, Southern, and Eastern Asia, in all except the northern part of Europe.

"Fifth, that our present knowledge both of the anatomical characters and the cultural unity of even the earliest known branches of the human race, point to the descent from a single geologically remote stock, the blood and heritage from which constitutes a prehistoric brotherhood of man.

"Sixth, that convincing evidence of these outstanding facts of early human history rests on the indestructible flint and stone industry and upon absolutely consistent anatomical evidence clearly interpreted by four generations of experts, conscientious observers drawn from the ranks of laymen, of learned professions, of the clergy, especially of the Catholic church."

All of which, we may add, is in substantial agreement—so far as it goes—with everything that has been held and asserted by the best theological writers from the very beginning of discussion, excepting only the assumption of the infallible certainty of the above estimates of the geological time involved, and what to us appears (with due respect to Prof. Osborn) a wholly gratuitous assumption of the certainty of any "pre-human" stage within the development of the *Hominidae.* If this family be "composed of the existing and prehistoric races of Man"—the latter being known to us partly through the evidence of their fossilized skeletons, and partly through their cultural remains—we submit that there is no positive evidence for any "pre-human" stage anywhere *within* it; and as we know of no ancestors of man (of any description) *beyond* these limits, it is manifestly impossible to make any positive statements regarding either the human or pre-human characteristics of such hypothetical creatures. The very existence of such a race of beings must necessarily be established, before their human or pre-human characteristics can be discussed at all, and the evidence even for this, is, at present, entirely wanting. It is the very point to be ascertained, and not to be taken for granted. But while, as we see it, we are forced to take issue with Dr. Osborn on these minor points, we are in substantial agreement with his main position, *viz*: (a) that the evidence as it now stands is against the probability of man's descent from either ape or monkey; and whatever may ultimately be discovered as to his *bodily* descent from some lower animal form (of which at present we know nothing) that, (b) the spiritual, as well as the mathematical and artistic faculties of man, are *"not to be accounted for by Evolution."* Furthermore, in general, we especially admire the broad and sympathetic attitude of Dr. Osborn toward the philosophical and theological aspects of the problem, which so few specialists in science are able to appreciate.

NOTE B.

Since the foregoing pages were written, further confirmation of the unique position of man—both as regards his physical and psychical lineage—has been presented by Prof. Henry Fairfield Osborn; while another advocate of the view that Evolution has been polyphyletic rather than monophyletic has appeared in the person of Dr. Austin H. Clark, of the Smithsonian Institute. A summary of the views of these writers will be found in the following notes.

To the roll of eminent authorities who have recently abandoned the older view in favour of a definite polyphyletic interpretation of the matter, involving consequent concessions to the "Creationists," must now be added the name of Austin H. Clark, of the Smithsonian Institution, Washington, D. C. In a recent article contributed to the *Quarterly Review of Biology,* (Dec. 1928), he sums up the conclusion to which he has been led as follows:—"This long list of animal types represented by the fossils in the Cambrian and immediately succeeding rocks can have only one meaning. It shows conclusively that as far back as Cambrian time the status of the animal world was, *in its broader features,* just what it is to-day. . . Thus, so far as concerns the major groups of animals, the *Creationists seem to have the better of the argument. There is not the slightest evidence that any one of the major groups arose from any other.* Each is a special animal complex related, more or less closely, to all the rest, and appearing, therefore, as a special and distinct Creation. (Italics ours.)

"But *within* each major group we see a very different picture. Here the fossil record shows a constant change from one horizon to another. These successive variations are probably simply indications of a direct response to physical alterations in environment favoring now one type or sub-type, now another. This continuous alteration of the elements within the various groups is what is commonly known as Evolution."

This is virtual recognition of the principle that Neumayr expressed in his doctrine of Palaeontological Species, and which has been reiterated by Wassmann in his theory of Natural Species. We may further add that, with certain qualifications, it is substantially the view entertained by the present writer, as will appear further on in these pages.

NOTE C.

Still more recently Dr. Austin H. Clark has contributed an article to the *Southern Churchman* (Richmond, Va.) stating more definitely though in popular language, his attitude toward the problem of man's origin. On this point he appears to be in essential agreement with Dr. Osborn. He says, "While man is obviously similar to the apes and belongs to the same division of the mammals, yet *the differences between man and the apes seem to be too great ever to have been bridged by intermediates,* and of all the fossils that have been found not one represents indubitably a 'missing link.' Man represents a collateral line parallel to the apes, but he was never one of them. He appeared suddenly in essentially the same form as that in which we know him now." This is indeed a clear, and most gratifying statement of the matter, which we most heartily endorse.

On the other hand, we cannot agree with the further statement of Dr. Clark that this view of the matter was that which has always been entertained by "the leading Evolutionists." To say, in regard to "the assumption that man descended from. . .a monkey" that "none of the leading Evolutionists ever have claimed this;"—that "Professor T. H. Huxley, who was the leading exponent of Darwinism, and Professor H. F. Osborn, who is the ablest and best known of the Evolutionists of the present day, both specifically denied it";—that "it is an idea that has been promulgated and fostered by the camp followers of great leaders, but not by the leaders themselves"—is, to say the least, decidedly misleading. That there have always been authorities of distinction that have denied man's descent from either monkey or ape, is quite true, and we have taken pains (in the foregoing chapter) to emphasize this point as a part of our argument; but to say that "none of the leading Evolutionists have claimed this" is a proposition which cannot be substantiated. No one of them, so far as we are aware, ever contended that man could have sprung from any of the apes *existing today.* "No competent scientist," says Prof. Haeckel, "ever said anything so foolish," but both Darwin and Haeckel are explicit in their contention that man descended from the Catarhine or Old World Monkeys. "The Simiadae. .branched off into two great stems, the New World and Old World Monkeys; *and from the latter, at a remote period, man, the wonder and glory of the Universe, proceeded.*"* Moreover, in speaking of the hypothetical ancestor of both the Catarhine and Platyrhine Monkeys, Darwin contends that "a naturalist would undoubtedly have ranked (him) as an ape or a monkey," and "as man from a genealogical point of view belongs to the Catarhine or Old World stock, we must conclude, however much the conclusion may revolt our pride, *that our early progenitors would have been properly thus designated.* But we must not fall into the error of supposing that the early progenitor of the whole simian stock, including man, was identical with, or even closely resembled, any *existing ape or monkey.*"**

It is needless to add that Prof. Haeckel repeatedly advanced the same opinion, and in almost the last words ever published by him, he re-asserts this belief in no uncertain language;—"I maintain that the descent of man from extinct Tertiary anthropoid apes is proved just as plainly as the descent of birds from reptiles, or the descent of reptiles from amphibians, which no zoologist hesitates to admit today."§ Even Wallace, who, as we have shown, denied that the higher intellectual and moral faculties of the human mind, could have been derived from the brute, believed that on his bodily side, man "descended from the apes." This also was the view of Gustav Schwalbe, Professor of Anatomy in the University of Strassburg, who not only energetically defends this older interpretation of the matter, but further declares that "a theory which derives man directly from lower forms *without regarding apes as transition types leads ad absurdum.*"† Substantially the same interpretation of man's descent from large

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***Descent of Man*, Ch. VI., p. 161, pop. ed.

***Id.* pp. 150, 151.

§*Last Words on Evolution*, p. 76.

†See Ch. IV., in Essays entitled, *Evolution in Modern Thought*, p. 141.

apes or ape-like forms, of the Oligocene is defended by Sir Arthur Keith, and other recognized authorities to-day, and is represented as the orthodox view of the matter in many text-books;—for example, Pirsson and Schuchert's *Text-Book of Geology,* Vol. II. pp. 671, 672. It is useless, therefore, to deny that man's descent from the monkey or the ape has been a favourite opinion from the very beginning, and among many of the highest authorities not excepting Darwin himself. And while it is true, as Dr. Clark asserts, that so great an authority as Prof. Osborn now denies that the human race has so originated, it is also true that in enunciating this conclusion, he speaks of it as a discovery both new and unexpected;—*i. e.,* not in accordance with what he, and most Evolutionists, had hitherto imagined to be the truth. He distinctly asserts that it is the recently discovered evidence "embracing hundreds of specimens of the fossilized remains of man," *etc.,* that has forced this conclusion upon him. "With clarion voice these irrefutable witnesses of our past positively demonstrate two *new and somewhat unexpected* truths: first, that man has not descended from any known kind of monkey or ape, fossil or recent; . . . .Second, man has a long, independent, superior line of ascent of his own," etc.*

NOTE D.

In further corroboration of the above, we have now to record what appears to be the latest (Jan. 1930) expression of opinion by Dr. Osborn. In his address recently delivered as retiring President of the American Association for the Advancement of Science at Des Moines, he is reported to have reiterated his rejection of the ape-man theory of Darwin *et al.,* and in stressing the great antiquity of the human race, to have asserted that the evidence now justifies the belief that the so-called Piltdown Man (*Eoanthropus dawsoni*) lived within the Tertiary;—the remains of this man, together with the flint implements associated therewith, being of the Upper Pliocene. The size of the brain, and the skilfully fashioned weapons, are mute but unmistakable evidence that even at that remote period, man was genuine man.

NOTE E.

It is too early to sift the evidence regarding the so-called Peking Man (*Sinanthropus*), but there is nothing, so far reported, that would appear in any way to invalidate the conclusions already expressed. The remains appear to be distinctly *human,* and, according to the testimony of Father Teilhard de Chardin and Dr. C. C. Young "are later than the Pliocene and earlier than the Loess—in other words, they are Lower Pleistocene." The discovery is highly interesting and important, but in so far as the specific point at issue is concerned, is of no particular significance.

**The Earth Speaks to Bryan,* pp. 9, 10.

NOTE F.

Again, that "Man can not trace his physical ancestry to any existing or fossil genus of the great apes"—a "line of scientific argument *directly contrary to Darwin's original theory as to the descent of man,* is advanced by Gerrit S. Miller, Curator of Mammals of the Smithsonian Institution, in a report to the American Society of Mammalogists through its official journal. Mr. Miller's discussion was evoked by an article by a distinguished British Anthropologist, G. Eliot Smith, who traces modern man from the great apes of the Tertiary geological period with such intermediate steps as the Java Man, *Pithecanthropus,* and the so-called Dawn Man of Piltdown, England, *Eoanthropus.* Mr. Miller does not reject the idea of a derivation of man's physical ancestry from somewhere in the simian line," etc. A careful reading of the above statements appearing in *Science,* Dec. 16, 1932, together with the rest of the article, will clearly reveal three things—(*a*) That Darwin's own theory originally traced man's descent from the apes. (*b*) That G. Eliot Smith today traces it from the great apes of the Tertiary Period; and (*c*) That Gerrit S. Miller, though denying this last interpretation, does not deny man's *simian* origin. In the light of these and many other statements of well known authorities that might be cited, it is preposterous to assert, at this late date, that the simian origin of man has not been time and again advanced by leading authorities.

NOTE G.

The limit of polyphyletic theories has apparently been reached by Dr. Hans Przibram in his *Theory of Apogenesis.* "I do not think it likely," says he, "that a single substance can have given rise to a general phylogenetic tree according to the classical diagram representing the affinities of species and their distribution in space and time. All the facts would be explained more easily by supposing that there existed, at the beginning, many organized substances developing side by side into species, each of the latter passing through stages more and more advanced without actual relationship of descent between the different species."*

"Many authors have believed in a multiplicity of the primordial forms of life, but few have suggested an independent origin for grades lower than the main phyla." (W. T. C.)

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*See his work reviewed by W. T. Calman, D. Sc., F. R. S., in *General Science,* May 31, 1929.

CHAPTER III

The Meaning of Evolution

THE real difficulty underlying most discussions between scientists and theologians on the subject of Evolution, lies in the vague manner in which that term is commonly employed. Even in scientific circles it is often, though not always, used as though it were synonymous with continuous development of any kind, whereas, in point of fact, in the modern, technical, biological sense, it is synonymous only with *one specific mode* of development. Thus, it is altogether erroneous to treat the modern theory as though it implied nothing more than a "continuous change," or even a "continuous progressive change," from "the simple to the complex," or "from relatively unspecialized to highly specialized forms"; or again, to suppose that it may be defined merely as "the history of the steps by which an organism, or group of organisms, has acquired the morphological and physiological characters which distinguish it to-day."* If this were really all that is meant by the term, then we would have to admit, not only many ancient philosophers, but many modern scientists who distinctly repudiated the present theory, into the ranks of the *bona fide* evolutionists. The famous Greek philosopher Empedocles, for example, taught that the development of Life had been a gradual process—that plants were brought forth before animals—that imperfect forms were gradually replaced by more perfect—yet despite all these anticipations of the modern view, he missed the really vital, characteristic, and essential feature of the later theory. As Prof. J. Arthur Thomson truly remarks, "the fundamental idea of one stage giving origin to another was absent" in his scheme. It was an orderly succession, a true development according to a definite Law, but for all that it was not an "Evolution" in the modern, technical sense. So also, neither Agassiz nor Dana would have had any quarrel with Darwin, Haeckel, and other Evolutionists of their day, had the teaching of the latter involved nothing more than what is implied in the above, and similar expressions, which are wide-spread in the popular literature of the subject.

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*Much of the literature emanating from high scientific authority, and issued for the conversion of anti-evolutionists is saturated with this specious argument—a mere "Sop to Cerberus". Moreover, many other works not written for such a purpose, evince the same fallacy. For example, Lloyd Morgan writes—"Evolution, in the broad sense of the word, is the name we give to the comprehensive plan of sequence in all natural events." This is precisely what the word does NOT mean—otherwise Agassiz, Dana, et. al., were Evolutionists.

Both of these distinguished scientists were emphatic in affirming an orderly progression or development in Nature, and that, too, from the simple to the complex, from the relatively unspecialized to the specialized. Indeed, Agassiz was one of the very first to point out that this progression or development had been one of the "differentiation" or "specialization" of certain very generalized types, which he variously termed "connecting," "combining," "synthetic," and even "prophetic" types, and Dana, time and again, expresses the same opinion, declaring "the Law of all development" to be "this Law of Specialization —the general before the special."* It was not, therefore, the idea of *development* that they were disputing, nor even development from what we commonly designate lower to higher forms (*i. e.*, even development from the simple to the complex, from the general or unspecialized to the highly specialized), but only the further assumption that the link connecting the various terms in such development was necessarily a *genetic* and *material* one, in which the antecedent "gave origin" to the consequent. As the successive terms in a mathematical series, or the successive chords in an harmonic progression have no physical connection one with another, and yet constitute a genuine develop-

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**Geology*, p. 599.

ment, operating under specific laws, so both Agassiz and Dana interpreted the succession of species in geological history, as a true and orderly development, but denied that there was any physical or genetic connection between these "terms" in the great organic sequence. "There is a manifest progress," says Agassiz, "in the succession of beings on the surface of the earth. This progress consists in an increasing similarity to the living fauna, and among the vertebrates, especially, in their increasing resemblance to man. But this connection is not the consequence of a direct lineage between the faunas of different ages. There is nothing like parental descent connecting them. The fishes of the Palaeozoic Age are in no respect the ancestors of the reptiles of the Secondary Age, nor does man descend from the mammals which preceded him in the Tertiary Age. The link by which they are connected is of a higher and immaterial nature. . . .Man is the end toward which all the animal creation has tended, from the first appearance of the first Palaeozoic fishes."*

In like manner, Dana tells us that geology testifies that there has been a development, and that this development has always been presented as the unfolding, through specialization of a "comprehensive" (*i. e.*, synthetic) type. "There was an unfolding of a type,—an exhibition of it through the successive appearance of new groups, in which groups, characteristics before only foreshadowed, or existing only in potentiality, come out into full expression. The early general or comprehensive type thus becomes, in a sense, specialized, or represented in numbers of special groups. . .This Law of Specialization—the general before the special—is the law of all development."† To the uninitiated this sounds like "Evolution," and indeed if, as already stated, we are to take seriously certain common-place descriptions of the process frequently met with in popular scientific works, it *is* Evolution. But, as every one knows, Dana was not an Evolutionist, but stood squarely with Agassiz on this

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*[*Principles of Zoology*, pp. 237, 238.

†*Manual of Geology*, p. 599.

point.[*] Indeed, only a few pages further on, he hastens to assure us that this does not mean Evolution. "With regard to the origination of species, geology suggests no theory of natural forces. It is right for science to search out Nature's methods, and strive to employ her forces—organic and inorganic—in the effort, vain though it prove, to derive thence new living species. The study of fossils has given no aid in this direction. It has brought to light no facts sustaining a theory that derives species from others, either by a system of Evolution, or by a system of variations of living individuals, and bears strongly against both hypotheses."[§]

It is obvious, therefore, that we must sharply distinguish between "Development" and "Evolution", for although, etymologically speaking, there may be little grounds for making this distinction, yet in the technical sense in which scientists use the word "Evolution" to-day, they clearly differentiate the process from all other forms of "development" which have, from time to time, been advanced. With them Evolution does not merely signify an orderly sequence of phenomena, even though such sequence be characterized as a process from the simple to the complex, from the unspecialized to the specialized, for such a sequence may not necessarily involve any genetic and causal connection between the terms, which is of the very essence of the modern Evolutionist's conception. This statement must be particularly stressed, for only within the past four or five years there has been a noticeable weakening upon the part of many of the leading Evolutionists on this point, and a desperate effort is being made to try to include within the formula of the Evolution process "movements" and "events" in Nature which cannot by any stretch of the imagination be made to fit in with the hitherto consistently maintained interpretation of that word. —attempts which involve the absurdity of making a differentiation (Evolution) identical with an integration (Involution).

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[*] We may even allow that because Dana's theory assumes the "unfolding" of the potentials latent in particular types, it is, as a matter of fact, a theory of Evolution; but, as will appear later, because of the absolutely independent character of the types in question, as well as for other reasons, it is not to be identified with the modern biological interpretation of the word. It was not a biological but an idealistic Evolution with him—i. e., the progressive actualization of an Ideal Type or Plan, with no physical or genetic connection between the Terms.

[*] See Note at end of this chapter.

[§] Id. pp. 601, 602.

As we shall presently see, both etymologically and historically, this interpretation of the current biological theory is inadmissible. Evolution, with the modern biologist, is synonymous with "derivation" or "descent," and is, in fact, commonly spoken of as the "Doctrine of Descent," the essential idea being that whatever appears in any given individual was already potential in the parental or antecedent form, and has thus been *derived* therefrom. It may be difficult to give an altogether satisfactory definition of the term, but if there is one thing that does stand out clearly in all intelligent discussions of the subject, it is that the causes operating are *within*, and not external to, the developing material—that they are all "*immanent*" therein, and never at any time (as theologians have falsely contended) *transcendental* thereto; that, in a word, nothing is ever actualized in a given development that was not originally potential in the germ. Thus, LeConte says:—"Evolution is (1) continuous *progressive change*, (2) *according to certain laws*, (3) and by means of *resident forces*,"* and still more explicit is the statement of Cope—"The doctrine of Evolution may be defined as the teaching which holds that creation has been and is accomplished by the agency of the energies which are intrinsic in the evolving matter, and without the interference of agencies which are external to it."§ Further, this understanding of the matter is inevitable from the whole history of the word. Evolution, we are told, is from the Latin, *evolutio*, an unrolling, and signifies "An unfolding or unrolling as of a scroll; hence a process of opening out, or developing what is contained or implied in something" (Webster's *New International Dict.*) In short, it is the unrolling or "evolving" (L., *evolvere*) of what is already involved, the bringing to light or actualization of what is concealed, latent, or potential within a given germ or integral. The old Evolutionists imagined that the entire organism, with all its parts and organs complete, pre-existed in the germ-cell, and

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**Evolution and Religious Thought*, p. 8.

§Cited by Stackpole, *Biology*, p. 128.

Evolution was simply the "bringing forth" into view, by a process of magnification or enlargement of this ultra-microscopic form; and while this view of Preformationism has long ago been abandoned in favor of Epigenesis, yet, nevertheless, the agencies which determine the successive appearance or actualization of the different parts, even in this latter theory, are assumed to be potential in the germ—*inherent in the developing material.* In short, Evolution assumes that there is nothing actual in the development that was not potential in the germ. As Huxley himself has expressed it "the definition of a germ as 'matter potentially alive and having *within itself* the tendency to assume a definite living form,' appears to meet all the requirements of modern science."*

But, in spite of the indubitable character of the evidence, we are fully aware that this statement of the matter will be roundly challenged by those who are shrewd enough to foresee the fatal consequence to which it leads. Indeed, no one has more clearly appreciated the danger than Professor Huxley himself who, in utter disregard of the statement just quoted, proceeds immediately to argue for a different interpretation of the word "Evolution" in order to escape the difficulties which he clearly foresees must inevitably beset the consistent Evolutionist when attempting to account for all the "events" of Nature upon this principle *alone.* Thus, he hastens to assure us that "we cannot now press the etymological force of the word. Evolution has no doubt been conceived as an "unfolding of something already contained in the original, and (Note!) *this view is still commonly applied to organic Evolution both of the individual and of the species.* It will be found that certain metaphysical systems of Evolution imply this idea of an unfolding of something existing in germ or at least potentially in the antecedent.§ On the other hand, the modern doctrine of Evolution, with its ideas of elements which combine, and of causation as transformation of energy, does not necessarily imply this notion. It may be remem-

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***Encyc. Brit.*, Art., "Evolution."

§Are we then to infer that the "Systems" of LeConte and Cope (cited above), to say nothing of others, were "metaphysical"—that these men were not representative modern scientists?

bered that some of the arguments brought against the modern doctrine rest in *the fallacious assumption* that the word is still used in its etymological sense, and that, consequently, that which evolves must contain in some shape what is evolved (*e. g.*, inorganic matter must contain life and consciousness)".*

Very well, then, here is a clear-cut issue. If the properties of life and mind were not already *involved* (*i. e.*, as potentials) in inorganic matter, how, in the name of common sense, can Evolutionists continue to hold the doctrine of abiogenesis as true at least of the first appearance of life in the geological past, if not an existing fact at the present? Have our "modern" Evolutionists surrendered this opinion? Did Mr. Huxley himself repudiate it as impossible even when he wrote these words?

Moreover, if we are in error in this matter—if "modern" Evolutionists do *not* hold (as we allege) that "inorganic matter must contain the potentials of life and consciousness" in some real sense, why then do they object to the assertion of theologians that life and consciousness have been infused into such matter from without? Either life and consciousness were all along inherent or "potential" in inorganic matter, and in process of time (as potentials therein) were actualized or "evolved" therefrom, or else they were not potential therein, have not been actualized or evolved therefrom, but being *ab origine* "without" or "transcendental" to such inorganic matter, have entered into it *ab extra*. Will the "modern" Evolutionist accept that proposition? If so, controversy is at an end, for that is all for which the theologian has been contending. But will the "modern" Evolutionist accept that proposition? Are we to understand that,—whatever the camp followers may say and teach to the contrary—the real authorities in science no longer hold that we can discern in "the latent powers" of such inorganic matter "the promise and *potency*§ of all terrestrial life," (Tyndall); no longer believe, and hope to demonstrate, by some process of "photosynthesis", (Baly) or other method of combining non-living chemical and physical energies, that life is

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**Amer. Encyc. Brit.*, Art. 'Evolution' p. 2342.

§ *i. e.* "potentiality".

a natural or mechanical "resultant" of these forces, in precisely the same manner that water is the product of the hydrogen and oxygen combined? Are we to understand that the leading authorities no longer maintain the opinion that life appeared for the first time upon this planet solely as the product of "the latent powers" of the inorganic matter then existing, but was either created *de nova*, or else as a primordial constituent of the cosmos was brought hither from some other world or region of inter-stellar space? If so, it would be interesting to have a categorical statement to that effect from recognized authority. Are we to understand that abiogenesis is no longer regarded as a necessary dogma of the consistent Evolutionist, even though it be reluctantly admitted that all the *actual evidence* we have is in favour of biogenesis? Are we to understand that modern biology, because of the failure of all attempts either to manufacture living protoplasm out of non-living physical and chemical forces, or to explain how the miracle might have been performed by Nature, have altogether abandoned the "expectation" of Huxley himself that if it might be given him to look beyond the abyss of geologically recorded time to that "remote period when the earth was passing through physical and chemical conditions, which it can no more see again than a man can recall his infancy, I should expect to be a witness of the evolution of living protoplasm from not living matter"? Are we to understand that modern biologists no longer indulge such an "expectation" as a logical implication of their theory of Evolution, but, on the contrary, maintain today that life was *not* potential in the antecedent chemical and physical forces of inorganic nature—was *not* evolved therefrom—but was an altogether new factor introduced into the sphere of the non-living *from without?* Are we to be told that such reputable scientists as Nägeli and Haeckel (not to mention a host of others) were entirely mistaken when they stressed abiogenesis as "*an indispensable thesis* in any natural theory of Evolution," and that our present-day Evolutionists now utterly repudiate the interpretation of these two great authorities when they affirm that "to reject abiogenesis is to admit a miracle"?

Yet why this insistence upon abiogenesis (for which it is acknowledged there is no proof whatever) if it be not for the fact that Evolutionists fully realize that it is of the very essence of their theory that there can be no "breaks" in the chain from the inorganic to the organic, from atoms to man, but that life, mind, spirit—in fact everything that has emerged in the course of cosmic development was originally potential in inorganic matter—that all has come about through the operation of forces immanent ("inherent") in the primordial matter? As LeConte expresses it—"I believe that the spirit of man was developed out of the *anima* or conscious principle of animals, and that this again, was developed out of the lower forms of life-force, and this, in turn, out of the chemical and physical forces of Nature."* It is simply preposterous for any man to question the fact that this has been the central thought underlying every "orthodox" interpretation of the modern theory of Evolution from its very beginning—*viz*: that in some real sense the forces of inorganic nature—the ordinary physical and chemical forces—hold within their own nature "the promise and potency" of all that has since emerged.

It is indeed quite true that within the past few years there has been great disquietude and searching of heart with respect to this matter, and it is precisely this ill-concealed annoyance at the sudden turn of events that we propose to discuss in these pages; but whatever change of front there may be in store for the Evolutionist to-day, let him face the fact squarely that this interpretation of the matter which we have given, has been undoubtedly the orthodox view which science has been emphasizing all along,—and that despite the rapidly increasing indications of dissent, it continues at this very hour to be the generally accepted interpretation with the majority of biologists. For is it not true to-day that the majority of our Evolutionists still entertain the dream that life and mind must, in some way, be explained in terms of matter and mechanism—the *product of* some mysterious power latent in the very constitution of physical and chemical energies? Would any one be so foolish as to

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***Evolution and Religious Thought*, p. 313.

assert that no reputable exponents of the theory of Evolution to-day would maintain that the same physical and chemical energies operating in the inorganic world, and responsible for all the phenomenal properties of such inorganic matter, are likewise responsible for all the phenomena of life and mind, and that though vastly more complicated, we shall yet be able to explain these latter phenomena in terms of matter (*i. e.*, physical and chemical forces) and mechanism? Are we to understand that, as now conceived, Evolution does not mean a "natural history of the cosmos including organic beings, expressed in physical terms as a mechanical process"? That Prof. James Sully had no support of recognized authority when he gave this definition of the theory in the *Encyclopaedia Britannica* (Eleventh Edition) and proceeded further to assert that "in the modern doctrine of Evolution the cosmic system appears as a natural *product* of elementary matter and its laws. (That) the various grades of life on our planet are *the natural consequences* of certain physical processes involved in the gradual transformations of the earth"? Are we to believe that the "mechanists" have all been banished from the ranks of authoritative science to-day? That there are no longer any reputable biologists that would advocate a purely chemico-physical explanation of life and consciousness? Have all the Haeckels, Nägelis, Jacques Loebs, etc., been ostracized, and only the Wallaces, the Reinkes, and the Drieschs—the Creationists and the Neo-Vitalists—now allowed to speak authoritatively for the "modern" theory?

The question has only to be asked, to be answered. Now we admit that there are a few leading thinkers among present-day Evolutionists who feel, and feel deeply that something is wrong, and who are lifting their voice against the dangers of materialism in these mechanical attempts to explain the phenomena of life, and even of "biologism" in the attempts to account for the higher powers of the human mind, but the trouble with these men is that while realizing the dangers that beset the old, and unquestionably orthodox interpretation of the theory, they are equally as unwilling to come out squarely and admit the truth that they have so long denied in the counter theological view; and in the attempt to extricate themselves from this perilous situation betwixt Scylla and Charybdis are vainly soliciting the recent doctrine of "Emergences" for a possible solution of their difficulties. But real as are these "Emergences" in Nature (and they have long been recognized under other names by many scientists and theologians) they can afford no comfort to those who would explain the entire course of Nature in terms of an "uninterrupted" Evolution. As we shall presently see, "Emergences" are not the *products* of Evolution, but are actually the *"interruptions"* of that process, and themselves the manifestations of energy *ab extra—i. e.*, "from without" or "external to" the developing material. But let us return to the statements of Prof. Huxley.

If all that Prof. Huxley intended to assert, in the foregoing statement, was merely that modern authorities no longer interpret the process of Evolution as an "unfolding" in that purely mechanical sense in which it was conceived at the time the word was adopted, we would have no cause whatever to find fault with the statement. No present day authority would assert that Evolution is an "unfolding" in the same sense in which Bonnet, and the advocates of the Encasement and Preformation theories were accustomed to explain it. We are supposed to have outgrown this crude conception of the matter, and now cling to the idea of a true Epigenesis of structure; but it nevertheless remains a fact that the energies operating in this Epigenesis—predetermining the appearance, arrangement, and character of the actualized parts both in space and time—are universally admitted to be present in the germ, or more strictly, in the integral of the development—otherwise there would be no law of heredity, no conformity to type, no explanation of the "recapitulation" phenomena observed in every ontogeny. Moreover, without the recognition of these internal and hereditary factors, there can, obviously, be no Law of Descent or Derivation, which is now very generally admitted to be synonymous with the Law of Evolution. To say, therefore, that we have outgrown that old interpretation of the process which would represent Evolution as mechanical "unfolding" of pre-formed parts, structures, or other already actualized physical units, is one proposition; to say that we have outgrown the idea that it is an "unfolding" of the "potentials" (*i. e.*, potential energies) inherent in a given germ or Integral, is quite another. Whatever our precise conception of the matter, the essential point to be observed is that in some real sense we admit that the causes or energies which produce the result are *within* the development, potential in its Integral.

But again, it is obvious that Prof. Huxley would endeavor to mollify the difficulty by talking vaguely about the mystery of elements combining and of energy undergoing transformation, but how are these facts necessarily tied to his or to any other theory of Evolution? In attempting to refute the objection that whatever has been *evolved* from a given antecedent must necessarily have been first *involved* therein, he resorts to the specious argument that our modern conception of "elements which combine, and of causation as transformation of energy, does not necessarily imply this notion." True; but neither does it necessarily imply Evolution of any kind. This is the very core of the difficulty. We are accustomed to say that hydrogen and oxygen uniting in the proportion H_2O produce water—meaning that the same energies potential in these gases reappear in the water, though now manifesting themselves in a different form, and exhibiting wholly different properties. We say that there is no change in the energy (either of increase or decrease), although the form and the properties manifested by these energies are now (for some reason not understood) altogether different. Now, if this is strictly true, the water is certainly to be regarded as an evolution out of the gases, and even the new form and properties exhibited, can only be accounted for as the result of a "new synthesis" of the potentials already present in the uniting gases, brought about by some unknown but, nevertheless, internal cause. But how do we know that the union of the gases has not been effected by some cause or causes operating *from without*—how do we know that the "new synthesis" of potentials has not been likewise effected by the action of some external agent—nay more, how do we know this external agent might not have been the electric spark commonly introduced into the experiment, or if not this, some other stimulus of the environment? Not only are we unable to deny the possibility of such an explanation, but we must even assume its probability, and if this last explanation be correct, then we must admit that the water can no longer be regarded as an evolution out of the gases, but is a genuine "Emergence"—a "new creation"—brought about by the influence of an agent or agencies external or "transcendental" to the energies operating immanently in the gases. The illustration of Prof. Huxley, therefore, proves too much. The mystery surrounding this union of elements and transformation of energy only serves to call into question the entire explanation proffered by the Evolutionist—only serves to make more uncertain than ever the all too confident assumption that the sequence is *necessarily* an evolution at all, and not just as possibly a new creation.

While, therefore, it is by no means necessary to maintain with Bonnet and the early Preformationists, that what is evolved, already pre-existed as a completely pre-formed actuality in the germ or antecedent Integral of the development, yet it is just as undeniably necessary to assume that the entity "evolved" was solely determined and conditioned by causes of some kind resident in the germ or antecedent Integral, if the explanation of an "evolution" or "genetic derivation" therefrom is to be maintained at all; for it is perfectly obvious that if any one or more of the agencies necessary to produce the result were *not* resident in such germ or Integral, but, on the contrary, were *external* thereto, the entity in question was not wholly *derived* or *evolved* therefrom. It should be easily seen, therefore, that any attempt to abandon this original, and only defensible use of the term, is synonymous with abandoning the position that Evolution is synonymous with the doctrine of "descent" or "*genetic derivation*", and so, is simultaneously to admit the applicability of that word to the theories of Dana, Agassiz, and numbers of other "Developmentalists" who emphatically rejected the current view. Moreover, if all that is "brought forth" (actualized) in the development was not originally latent or potential in the germ, but something has been added or "infused from without," not only is it impossible to account for the *whole* process as one of "derivation" or "descent," but it is equally as plain that some of the commonest conclusions of modern Evolution must be altogether abandoned, and the possibility of certain theological postulates (now most vehemently denied) simultaneously admitted. A single example will suffice to point our meaning. If all the actualities of man's nature were not potential in the animal from which he is assumed to have "evolved," but some, on the contrary, have been "infused *ab extra*", what becomes of the central contention of Darwinians, Haeckelians, and most present-day Evolutionists on this point? It is of the very essence of the theory, as conceived by these authorities, and the "orthodox" school in general, that the *mind* of man is no exception to the rule, and that the contention of Wallace, Mivart, Wasmann, Osborn, *et al.*, that the "special faculties" of man's higher intellectual and moral nature "clearly point to the existence in man of something which he has *not derived** from his animal progenitors" (See words of Wallace cited in foregoing chapter), but, on the contrary, something which has been infused *ab extra*,§ is an utterly unscientific and unjustifiable assumption. To admit this, it is asserted, is to strike at the very roots of the theory of Evolution as the sole process going on in Nature, and by which the diverse forms of life have been brought into existence, and is virtually to admit the possible operation of all manner of transcendental agencies and metaphysical powers. And this is unquestionably true, for—once the principle is admitted—who shall be able to limit these external influences to purely physical energies? Either Evolution is development by means of Energies exclusively immanent in the developing material—*i. e.*, exclusively inherent in the very constitution of *matter* itself, or it is not. If you deny that it is, you simultaneously admit that *non-material* influences—yes, *im-material, meta-physical* agencies have cooperated in bringing about the result. Take whichever horn of the dilemma you please.

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*Note these words—"*not derived* from his animal progenitors." The sole objection of the "orthodox" Evolutionist to this position of Wallace is centered in the assumption that Evolution is synonymous with genetic derivation, and to admit that any characteristics of man's nature (whether physical or psychical) were "not derived from his animal progenitors" is only to admit that these characteristics are not to be accounted for as products of Evolution ("descent"), but—on the contrary—are products of an agent or of agencies ab extra—i. e., without or "transcendental to" the developing material (and the energies "immanent" therein). It is precisely because theologians have maintained this very principle (here expounded by Wallace) in regard to the origin of the higher mental functions of man, that their views have been denounced as anti-Evolutional and unscientific.

§If objection be raised to the expression "something which has been infused *ab extra*," we will gladly substitute "something which has been effected by means of an agent or agencies ab extra"—which is all that we are trying to assert.

To the strictly consistent, then, it would appear that, in the case of organic Evolution at least, even the external influences of the ordinary physical environment would have to be excluded. But while there have been, indeed, a few extreme orthogenesists, like Nägeli, who have virtually assumed this position—flatly denying that the influence of the environment counts for anything positive or concrete in the result—few have been able to follow them. It is worth while to note, however, that this radical view of the matter has had its defenders. In the opinion of Nägeli, plants and animals would have developed very much as we see them today even if the physical conditions of the geological past had been very different from what they really were. Such an iron-clad orthogenesis, however, has not met with much favor. There is a general feeling among biologists that the environment does count for something positive and even considerable in the result, and accordingly, we find certain Evolutionists cautiously expanding the definitions of LeConte and Cope to include this problematical factor. Thus, Prof. J. Arthur Thomson tells us:—"It must be borne in mind that the general idea of organic Evolution— that the present is the child of the past—is in great part just the idea of human history projected upon the natural world, differentiated by the qualification that the continuous "becoming" has been wrought out by forces *inherent in the organisms themselves and in their environment*".

But if this be so—if it be frankly admitted that the agencies

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[*] *Evolution in Modern Thought*, Chap. I., "Darwin's Predecessors," p. 5.

concerned in organic Evolution are not all of them resident in "the developing material" (*i. e.*, "the organisms themselves") but that these "internal" energies are actually supplemented by agencies *ab extra*—i. e., "in their Environment"—that energies "transcendental to" the developing organic material, do actually enter into it from without—how will the Evolutionist square his account with the theologian? Is not this a surrender of the cardinal point at issue in the whole discussion? Of course, the Evolutionist may seek a temporary refuge in another line of argument. It will be asserted that this conclusion does not necessarily follow, for all that the biologist here means when he uses the word, *environment*, is the *material* environment of the organism—the world of purely physical forces by which the organism is surrounded. He is not assuming the possibility of any meta-physical or im-material influences, *ab extra*, such as the theologian assumes. In short, if driven to define his attitude more particularly, he will freely admit the inadequacy of such definitions of organic Evolution as those of Cope and LeConte, but will simultaneously argue that in admitting the influences of an external environment which is purely physical or material, he is not surrendering his position to the theologian, but merely re-establishing his theory of Evolution upon a broader basis. He will concede the error of attempting to explain organic Evolution as an independent process, operating solely by virtue of the energies resident in the living matter (protoplasm). He will, on the contrary, affirm that organic Evolution is only *a particular phase of a wider Evolution* that is going on throughout the entire world of matter—only a special mode, in other words, of physical Evolution; and thus, while it is indeed impossible to explain it altogether in terms of the energies resident in the living material (*i. e.*, the protoplasm), it is nevertheless still to be explained—entirely explained—in terms of the energies resident in matter as such. There is no need to call in the aid of im-material or meta-physical agencies. In short, he argues that inasmuch as living protoplasm is itself the product of the physico-chemical forces of inorganic Nature, it follows that all the factors concerned in the process of organic Evolution—both those within the living organism and those within the environment—(both external and internal)—have been derived from a purely physical universe;—hence have been potential in the very nature of matter itself, and that, therefore, it is wholly unnecessary and illogical to assume the existence of any *meta*-physical or *im*-material influences to account for the result. In short, he will maintain with Tyndall that matter itself (*i. e.*, physico-chemical energy) holds "the promise and potency" not only "of all terrestrial life," but likewise of all consciousness, mind, personality, and whatever else is commonly included in the category of so-called immaterial or spiritual reality; and that, consequently, all these last phenomena are to be explained in terms of matter and its movements—*mechanism*. But this is an obvious begging of the question. In the first place, we are not assuming the existence of any hypothetical entities such as life and mind. Life and mind are already present with us. They are as genuine facts of experience as heat, light, electricity, or any other physical and chemical energies. We might ask with equal reason, why assume the existence of such physico-chemical energies. This very objection, though time and again proffered by materialists, is in itself sophistical. They are forever assuming that the only energies we know, or have any direct experience of, are physico-chemical energies; while in the very next breath, they proceed to explain the existing agencies of life and mind in terms of them. This will not do. The materialist can no more question the reality of these agencies than can the theologian. He assumes them at every turn. It is not true, therefore, that we are "inventing" a number of meta-physical agencies to account for vital and psychical phenomena. These peculiar agencies are already in our midst—are already directly experienced in consciousness—and the only question to be solved is that relating to their *origin*—not that relating to their *existence*. There is no question whatever about the latter. In trying to explain their origin, however, the materialist resorts to the hypothesis that they are derivatives from physico-chemical energies; whereas the theologian maintains that they are *sui generis*—underived and primordial.

Now, in attempting to decide which of these two positions is correct, it is obvious that only an impartial consideration of all the facts bearing on the problem—physical and psychical—can bring about an honest solution; and as it is now universally admitted that all attempts to prove the theory of spontaneous generation or of abiogenesis in any form, have completely failed, and all similar attempts to explain consciousness in terms of unconscious mechanism have been equally futile, it must at least be granted, at the very outset, that all the evidence so far adduced is distinctly opposed to the materialistic interpretation of the matter, and altogether in favor of that espoused by the theologian. In short, the burden of proof rests not with the latter, but with the former. In the light of the actually established facts, the materialist must "show cause" for continuing to maintain his theory. How do you know that life and mind are derivatives from matter? How do you know that living protoplasm is nothing more than a product of physico-chemical forces? How do you know that consciousness is but a product of unconscious mechanism? How do you know that life, mind, and personality, are only mechanical resultants of physical forces—in short, how do you know that all organic and psychical Evolution, is but a special phase of the wider process of inorganic Evolution? As matters now stand, it should be obvious that all this is bare, unsupported *assumption.* It has no claim whatever to be regarded as an established scientific fact. It is not something that can be taken for granted at the very outset—as a given, indisputable truth—from which we can proceed to reason to certain inevitable consequences. Yet it is precisely this unverified and inexcusable assumption that underlies ninety per cent of all present-day expositions of the so-called "orthodox" theory of Evolution. If the evidence we have, really justifies such a position, well and good. Let us accept it. If, on the other hand, what evidence we have is all against it, let us as honestly again discard it. The problem to be solved is, what is the real origin of these (already existent) "spiritual entities"? Both parties admit the reality of certain things called *life* and *mind.* The question does not concern the "existence" of such things, but their *origin.* Are they simply resultants of physical and chemical forces, and so derived from matter; or are they manifestations of agencies distinct from, though associated with, these—hence metaphysical, immaterial agencies? The materialist assumes the first of these hypotheses to be true, the theologian the second. Both are legitimate as *hypotheses*, and only a careful examination of all the facts in the case can determine which of the two is correct. What therefore are these facts, and whither do they point? Now, the plain, unvarnished truth is that we have never yet been able to explain the phenomena of life, mind, and organic Evolution in terms of the forces and processes peculiar to the inorganic sphere. We have tried it, and tried it repeatedly, but all attempts to account for life in terms of physico-chemical reactions, or for mind and consciousness in terms of matter and mechanism, have utterly failed, and consequently, the theological hypothesis is the only one that remains tenable under the circumstances. And here it may be observed in passing that the suggestion of Huxley that there is no more difficulty in accounting for life as the product of C, H, O, N, *etc.*, than in accounting for "aquosity" as the product of H and O, is a glaring fallacy. For whatever difficulty there may be in accounting for the properties of any chemical compound in terms of the properties of its constituent elements, yet it is at least patent in this instance that H and O plus a certain physical condition (*e. g.*, electricity) can be combined in the laboratory to form water; whereas there is absolutely no evidence that C, H, O, N, or any other combination of chemical elements, plus some physical condition (*e. g.*, sunlight), can be so combined to form living protoplasm. Furthermore, in the case of all ordinary chemical compounds we can combine and dissociate the constituent atoms at will, and always with the same result, thus proving their *equivalence;* while this is precisely what we can not do in the case of living protoplasm, thus plainly indicating that there must be some factor present in living matter other than the elements in question. Moreover, even when sunlight, or some other form of physical energy, is appealed to in the hope of discovering this "missing factor," the result is equally disappointing. In short, no synthesis of chemical and physical forces *alone* has ever resulted in the formation of living protoplasm, and wherever we can actually observe protoplasm being formed in Nature, it is always under the direct agency of *already existent life.* In short, we can demonstrate that H_2+O+ a physical stimulus is the equivalent of water; but we cannot demonstrate that $H_2O+CO_2+NH_3+$ sunlight (or any other physical force) is the equivalent of living protoplasm. If we could only do this, Huxley's thesis would stand; but it is precisely this which no man has ever yet succeeded in doing.*

Moreover, the further attempt to prove that the process of Evolution going on in the organic sphere is one and the same as that alleged to be taking place in the inorganic—a mere uninterrupted extension of the latter, and without the addition of any new factors or potentials—is again an assumption which has been made in defiance of all the evidence. We have the testimony of Professors Jordan and Kellogg in their *Evolution and Animal Life,* that "Biological Evolution and cosmic Evolution are not the same. From the biological side a certain objection must be made to this philosophical theory of universal or cosmic Evolution. In organic and inorganic Evolution there is much in common, so far as conditions and results are concerned; but the likenesses belong to the realm of analogy, not of homology. *They are not true identities because not arising from like causes.* . .It is not clear that science has been really advanced through the conception of the essential unity of organic Evolution and cosmic Evolution. The relatively

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*It is the presence of already existent life in the green leaf of the plant that is essential to the formation of new living matter (protoplasm) out of the chemical energies latent in CO_2, H_2O, NH_3, and the physical energy of sunlight. Unless this factor—(life)—itself be present as a primary condition, no combination of any of these chemical and physical energies is of any avail. It is this absolutely essential presupposition of life—as the invariable condition to the formation of new living matter out of the above mentioned chemical and physical forces, that renders it altogether absurd to talk about living matter being the effect, consequence, or resultant of these latter forces alone.—Failure to take note of this plain, self-evident fact is difficult to understand or to account for except upon the hypothesis of an altogether unworthy and unscientific prejudice. It should be self-evident that what is an *essential condition* to the formation of living matter, can never be logically interpreted as merely a *resultant* or *consequent* of the formation of such matter.

little the two groups of processes have in common has been overemphasized as compared with their fundamental differences. The laws which govern living matter are in a large extent peculiar to the process of living. . . .To regard cosmic Evolution and organic Evolution as identical or as phases of one process is to obscure facts by verbiage. There are essential elements in each not shared by the other—or which are at least not identical when measured in terms of human experience. *It is not clear that any force whatever, or any sequence of events in the evolution of life is homologous with any force or sequence in the evolution of stars and planets.*"* This language is unequivocal, and the importance of such an admission upon the part of these biologists—orthodox Evolutionists of highest standing—cannot be overestimated. Add now to this the well known and universally admitted facts that all attempts to demonstrate the truth of abiogenesis, or to explain the phenomena of life and mind in terms of the interaction of physical forces alone, have completely failed, and what other logical conclusion is left us but that life and mind are not the product of physical forces alone—have not resulted, therefore, as an evolution out of these forces—and that, consequently, they must be regarded as metaphysical, immaterial agencies—that is to say, agencies that have not evolved out of the Integral of matter, but, on the contrary, have *invaded* the sphere of matter *from without.* How reputable biologists of the day who freely admit the hopelessness of such "mechanistic" attempts to solve the problems of life and mind, can longer evade a frank admission of this truth, is difficult to understand.

In the matter of mind, too, this truth has long been recognized even by materialists themselves. No less an authority than Prof. Tyndall told the world years ago that "the passage from the physics of the brain to the corresponding facts of consciousness

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*See quotation, Stackpole's *Biology,* pp. 128, 129. As Prof. Cope pointed out years ago (*The Monist,* 1893, p. 630; *Primary Factors of Organic Evolution,* p. 475 *et seq.,*) the energies determining inorganic development and those determining organic development are not only not the same but they are directly antithetical. The first are catagenetic, the other anagenetic; the one destructive, the other constructive. And this fact has long been generally admitted. It is the life and mind energies that keep the universe from "running down."

is unthinkable"—which was only his way of asserting that such things as consciousness and mind could never be explained in terms of matter and mechanism—that the very attempt involved a proposition that was simply "*unthinkable*". In the same way also, Prof. Cope—one of the greatest of our American biologists—warned his fellow biologists of the absurdity of all such attempts, in even stronger language. "The attempt has been made," says he, "to identify hunger, for instance, with chemical energy, a proposition which is simply irrational." It goes without saying, of course, that Driesch and the Vitalists generally have founded all their theories upon this principle as a simple self-evident fact, while many other recent biologists who, for one reason or another, do not care to be listed with the Neo-Vitalists, nevertheless admit that the possibility of expressing the concepts of life and mind in terms of matter and mechanism is out of the question. Thus, we find Prof. J. Arthur Thomson constantly warning his readers against what he calls *Biologism,* as well as against that "materialism" which he declares is "an attempt to give a false simplicity to the ways of organisms by trying to fit them into the descriptive frameworks of chemistry and physics, without recognizing the distinctiveness of "life" and "mind".

But obvious as is the conclusion foreshadowed by these well known facts, the majority of biologists have been slow to make any direct confession on the subject. Unable to refute the evidence, but simultaneously, as unwilling to admit its significance, they have preferred to maintain a discreet silence on the subject, in the hope that, sooner or later, some unexpected solution of the problem might be discovered. This hope has recently been quickened by the sudden rise of the doctrine of "Emergence"—a theory which, in the hands of certain Evolutionists, is being adroitly used to cover up the weakness in the current theory, and give a plausible solution of the difficulty.

An emergence may be defined as the appearance in the course of Evolution of a phenomenon which though seemingly the "product" of the evolutional process, cannot apparently be accounted for in terms of that process. As Prof. J. Arthur Thomson aptly expresses it—a "resultant" which, nevertheless, "seems too large for the components"—an effect which appears to be greater than its cause. There are many instances of such emergences, which we need not here consider, it being sufficient for our purposes to point out the significant fact that the most conspicuous and revolutionary of all are these very emergences of life, mind, and spirit (self-conscious will), which are especially under discussion in this argument. Whatever may be said of the rest, these are universally admitted to be the most important that have ever occurred in the course of cosmic development. It should hardly be necessary to state that, from our point of view, the only explanation which can reasonably be assigned to such strange phenomena is that elements foreign to the development have entered into it—that the energies operating normally within the antecedent developments have, in some manner, been supplemented by agencies *ab extra.* As already pointed out, if it is altogether impossible to explain these phenomena in terms of the antecedent evolutions leading up to them, there is nothing else to do but to assume that this is the explanation. Strange as it may seem, however, the attempt has actually been made to account for these strange phenomena in terms of that very process of Evolution which they seem not merely to "interrupt", but, in principle, even to contradict. As already stated, Evolution has long been defined as a process of "differentiation," whereas these events are universally conceded to be the product, not of differentiation (hence—not of Evolution), but of *integration*—the very *opposite* movement. In fact, they are defined as "new syntheses" of potentials—that is new integrations—new Integrals of potentials. Indeed, it is because of this very fact that they are anomalous; for being, as stated, the products of integration, they cannot, for that very reason be accounted for as products of differentiation—*i. e.,* in terms of Evolution. If, therefore, the time honored definition of Evolution as a process of "continuous differentiation" is to stand, it is obvious that these events must be attributed to some other cause.

Confronted with this difficulty, then, it is apparent that the consistent reasoner must choose one or the other of two alternatives. Either he must deny that these "emergences" are the product of Evolution, and—because of their unique character as "new syntheses" of potentials—account for them as the product of the reverse process of "integration"; or else he must wholly revise his definition of "Evolution," causing that term to comprehend within itself both differentiation and integration. As acceptance of the first of these alternatives plainly carries with it an admission of the theological principle of creation, which is most distasteful to the iron-clad, materialistic Evolutionist; it is not surprising to find many of them turning to the second alternative as their only refuge. But can such a position be successfully defended? Of course, if the word *Evolution* is going to be arbitrarily extended to cover both the actualization of the potentials resident in a given germ, as well as the formation (creation) of the germ itself;—in short, if we are going, arbitrarily, to use it in such a way that it can mean both "origination" and "derivation," creation and development alike; it is obvious that it can mean anything and everything, and consequently, nothing. Under such circumstances, nothing can be proved, and nothing can be disproved. If reason itself is to be abandoned, naturally argument is at an end. It is precisely this delightful ambiguity which, as we have already seen, vitiates half the recent literature on the subject. The term *Evolution* as now used is so fascinatingly indefinite and elastic that it can be stretched to mean almost any kind of orderly development, and, consequently, is just as applicable to the views of an Agassiz or a Dana as it is to those of a Darwin, a Wallace, or a Haeckel. Under the circumstances, therefore, it occasions little surprise to be told that even "emergences" are now to be regarded as only a part of the natural order of Evolution, while the corresponding expression, "Emergent Evolution" is likewise hailed with delight, since it is obviously a most welcome covering for a multitude of sins.

Now there is really no excuse for this unwarranted muddying of the waters. The issue is too plain to be thus obscured. If "Evolution" is to be used to denote just any kind of orderly development in Nature, it is perfectly possible that these "emergences" may be a part of the logical sequence. Not only do we freely admit this, but we are at pains to emphasize it, since this is the very view which we have adopted in our own interpretation of the cosmic process. As stated on the title-page, we believe that "cosmic development is, in fact, an alternation of *integrations* and *differentiations,* of creations (*i. e.,* "emergences") and evolutions." But such a process is obviously not the Evolution with which the biologist is concerned, since this latter is comprehended within it as a single phase only of its own much wider movement. In short, we do not dispute the fact that both Evolution and Emergence are opposite poles of a yet higher, more comprehensive movement which we speak of as cosmic development (for this, and nothing less than this, is our whole contention), but we do deny that the second movement (within this polarisis), *i. e.* Emergence, is to be explained as a *product* of the first—Evolution. On the contrary, we insist that these two movements have nothing in common—that they are, indeed, opposite and antithetical. It is impossible to explain an emergence, which is admittedly an *integration* in terms of an evolution which is, admittedly, a *differentiation.* No evolution ever produced (brought forth out of its own integral) an emergence, though it is freely granted that evolutions have been "cut short", "interrupted" by emergences. In short, taking the word "Evolution" in the sense in which it has always been understood by biologists—*viz*: as the process of the progressive actualization and differentiation of the potentials latent in a given germ or ovum; and taking the term "Emergence" again in the technical sense in which biologists are now using the word, as a "new synthesis" of potentials, and therefore unaccountable in terms of any "differentiation" (Evolution) of the potentials in the "old synthesis," or "germ" of the antecedent development; we maintain that the one process is the *direct antithesis* of the other, and that no careful thinker can afford to make the statement that the second is but the natural product of the first. With this understanding of the matter (and it is the only understanding of it that is true to logic), no "emergence" was ever the "product" of Evolution, for though following directly upon a given evolution, in every instance we discover it to be an example of the saying, *post hoc, sed non propter hoc.*

But, in order better to understand the force of this objection, as well as to appreciate the real character and significance of these remarkable phenomena, it will be necessary for us to enter at some length into a discussion of the subject. Using the word "Evolution," then, in its only true and legitimate sense—the sense in which such eminent authorities as LeConte and Cope were accustomed to use it, and the only sense in which it has any bearing on the issues of science and theology—we find that it signifies at bottom the acceptance of the principle that there can be nothing actualized or "evolved" in any given development that was not originally "potential" or "involved" in its germ, (*i. e.*, its integral).

CHAPTER IV

The Mathematics of Emergence

WHILE affirming that "it is beyond the wit of man to number the instances of emergence" that may have taken place, Lloyd Morgan remarks that "salient examples are afforded in the advent of life, in the advent of mind, and in the advent of reflective thought"*—and that "such emergence of the new is now widely accepted where life and mind are concerned. It is a doctrine untiringly advocated by Professor Bergson. Wundt pressed its acceptance under his 'principle of creative resultants,' (*i. e.*, what we distinguish as emergents) which, he says, 'attempts to state the fact that in all psychical combinations the product is not a mere sum of the separate elements. . . .but that it represents *a new Creation.*' "§ It is these same emergences" we may add, that constituted three of the seven "world-enigmas" enumerated by Prof. Emil du Bois-Reymond in his famous *Ignorabimus* speech before the Berlin Academy. They were stressed by LeConte under the name of "Individuations" in his *Evolution and Religious Thought*, and they have ever formed the principal centres about which the battle has waged between the advocates of an absolutely continuous, uninterrupted Evolution, on the one hand, and those who hold to the theory of an Evolution interrupted, from time to time, by occasional invasions of extra-developmental energy (transcendental creations). What then is the true nature of these "emergences"? That they are "new syntheses," expressing a "new relatedness" is very generally admitted. It is further very generally held that the "newness" of the phenomenon as a whole—that which gives it character as an "emergence"—is due

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**Emergent Evolution*, p. 1.

§Id. pp. 3, 4. Italics mine.

to this changed "relatedness" either amongst the components as such entering into it, or else among the potentials of such components. But here we come to the crux of the whole problem which must now be considered at length.

There is a certain "newness" in nearly every chance combination or "grouping" of a number of units, and where intelligence directs the process, this "newness" may be of a very high order, and may even justify the characterization of an "emergence". The transformation of a disordered pile of bricks into the unity of a beautifully proportioned edifice, is an illustration. Here is a high order of "newness"—the expression of a "new relatedness" amongst the brick components—wrought (be it observed) by the intelligence of the architect. This is, in very truth, an "emergence". It is not, however, an emergence *of the same kind or order* as that with which the scientist is here concerned. In the emergence of the building out of the chaotic mass of bricks, there has been no change effected in the character of the "components" themselves. The individual bricks remain the same, and the newness consists altogether in their relatedness *inter se.* In the emergences with which we now have to deal, however, the components seem to disappear completely *to sense,* and the newness of the emergence cannot consequently be explained in terms of any new relatedness amongst these sensible components. Indeed, the sensible properties displayed by the emergent differ so profoundly from the sensible properties of the individual components which enter into it, that there would appear to be no logical connection between the two. The classical example is the emergence of water out of the union of hydrogen and oxygen. In emergences of this order we observe the further significant fact that "the product is not a mere sum of the separate elements" (Wundt)—as such—(*i. e.,* considered as sensible phenomena)—that the components entering into the union disappear in the process, *i. e.,* are reduced from sensible actualities to ultra-sensible potentialities (hence from actuality to zero)—so that the process is a true mathematical integration—the "new synthesis" being a synthesis of "potentials", and the "new relatedness" a new relatedness amongst these "potentials" (zeros) in the integral so formed. In short, the difference between these two orders of Emergences is the difference between an emergence due entirely to a *mechanical synthesis* (aggregation) of a number of *unchanged actualities*, and an emergence due to a true *mathematical synthesis* (integration) of a number of such actualities *to their corresponding "potentialities"* (i. e. zeros or potentials). In a purely mechanical synthesis the component actualities and their sensible properties do not disappear, but are merely re-arranged *inter se* to form a "new relatedness"; whereas in a true mathematical integration the component actualities and their sensible properties entirely disappear—*i. e.* are reduced to zero or potentiality; in short, are *annihilated* as actualities—and out of their rearranged potentials, new actualities, with altogether different sensible properties arise. Now, strange as it may seem, this last phenomenon is not only not rare in Nature, but, on the contrary, is so common that our familiarity with it is alone responsible for our not noticing its supreme importance. When Morgan asserts that "it is beyond the wit of man to number the instances of emergence," he not only states a profound truth, but one whose vast significance he himself, apparently, but vaguely appreciates. For not only is every phenomenal change an illustration of the principle of Emergence, but (what is more) an emergence wrought by the mathematical processes of Integration and Differentiation. *Every phenomenal change,* in other words, involves either the reduction (integration) to zero (potentiality) of an actual phenomenon; or the eduction (differentiation) out of zero (potentiality) of an actual phenomenon, or else a combination of the two processes. In short, all with which our minds are concerned in the study of Nature are simply phenomena—their appearance and disappearance, their "nascence" and "evanescence" in space and time; but we seldom stop to consider what this really means, *viz*:—the incessant *annihilation* and concomitant *creation* of matter (*i. e.*, spatially defined, quantitative actuality) that is constantly taking place before our eyes. To illustrate the deep significance of this fact, as well as its universality in Nature, we here present a synopsis of the more important instances of such emergences, as summed up by Prof. John McCrady, under the caption:—

NATURE OF CHANGE

EVERY CHANGE is either the reduction to zero, of one variable or the correlated emergence from zero, of another variable actuality—or it is one such reduction to zero + one such emergence from zero.

(1) Whenever two forces disappear in giving rise to a resultant, each of the two forces is reduced to zero, and the resultant emerges from zero. The like reduction and emergence occur, when a single force is replaced by two or more.

(2) Whenever kinetic energy becomes potential, we have manifest reduction to zero, of an actual finite variable.

Whenever potential energy becomes kinetic, we have manifest actual emergence from zero, of an actuality, variable and finite.

(3) Whenever the space between bodies disappears, we call this disappearance motion, and simultaneously always an amount of space equal to that which has disappeared, is evolved from zero, and becomes actual and apparent in the track of the motion.

(4) The course of time is a continuous emergence from zero, and a continuous reduction to zero—the only actual time being the present instant, the past and the future being both potential or zero.

(5) Whenever one or more forms of matter disappear under chemical conditions, their forms are reduced to zero, and the simultaneous rise of one or more new forms is strictly emergence of new matter from zero.

(6) In assimilation, food-matter is reduced to zero, and organized living matter evolved from zero.

(7) In genesis, both the sexual elements are reduced to zero, and the new being emerges from zero.

(8) In perception, matter or energy, or both, are reduced to zero, and in representation, matter or energy, or both, emerge from zero.

These, of course, are only a few of the numberless instances of the principle which might be cited, but they are of basic importance, and fully establish the truth of the argument.

Now it may, at first sight, appear that the foregoing explanation, in reducing the entire universe of phenomena to successions of integrations to and differentiations out of *zero*—*i. e.*, annihilations and creations of matter, eliminates the idea of Evolution altogether as a process of Nature; and this is undoubtedly true with respect to that unscientific (though still more or less popular) impression that regards Evolution, and other phenomenal processes, as involving a literal continuity of matter *per se* throughout all the fluctuations of "form". But this assumption is a fallacy. As a matter of fact, there is no continuity of matter *per se* anywhere in Nature. Not only is this supposition plainly contradicted in the biological sphere in the phenomena of metabolism and epigenesis, but also in the sphere of physics it is again controverted both in the electronic "atomicity" of matter, and the Quantum theory of Planck regarding the constitution of light. Everywhere in Nature, we discover that this material continuity is an illusion—that matter is really discrete—*i. e.*, made up of discrete particles, (or "pulsations" of energy) this corpuscular stream of separate units appearing continuous only as the separate drops of water in a fountain jet or the successive pictures in the cinema, appear continuous. In the same way, there is no continuity of matter in any evolutional process, each particle of matter appearing and disappearing, being actualized and potentialized (under the laws of Epigenesis and Metabolism) in space and time, in a ceaseless succession or series of phenomenal creations and annihilations. But while our conception of these processes has changed, the processes themselves continue indubitable, and wherever a given series of such discrete phenomena can be shown to originate out of a single, specific immaterial Integral —that is, to be the successive actualizations of potentials resident in a common germ or integral, and governed by a common Logos—there we have a genuine evolution.

In other words, we regard every phenomenon as an actualization of energy and while it is impossible to think of any succession of diverse physical phenomena—*a, b, c, d, e, f,*—as materially connected in such manner that *b, c, d, e, f,* may be looked upon as but so many modifications or rearrangements of the constituents of *a*—the "cause" of the series; yet, we may regard the entire series *a, b, c, d, e, f,* as but so many successive actualizations of a single im-material integral of potential energies. In short, while there is no physical or material continuity between the phenomena, *a, b, c, d, e, f,* there may be a *metaphysical* and *immaterial* continuity; and while no one of the phenomena in the series can itself be regarded as the cause of the next, yet all of them may be nothing more than the successive effects (actualizations) of a *single immaterial integral of potential energies.* Now any such series of physical phenomena (actualizations) which can be shown to arise epigenetically out of a single immaterial integral of potentials, is what we call an evolution.*

With this explanation of the matter then before us, it remains to be seen whether all the phenomena of Nature can be regarded as arising epigenetically out of a single such integral, and so forming a single "uninterrupted" evolution (monophyletic view); or whether what appears to be a single system is really a series of independent evolutionary systems, each arising epigenetically from its own proper, independent integral (polyphyletic view). In either case, however, there can be no justification for any theory of Evolution based upon the idea of actual physical or material continuity. In short, the proper definition of Evolution involves the idea of a series of phenomena (actualizations of energy) appearing epigenetically in space and time, and all the actualizations of a common immaterial integral of potential energies.

While, therefore, it is true that in the final analysis, all Evolution—and for that matter, all phenomenal actualization and change—is a manifestation of creative power; yet it is a question as to whether the universal process of cosmic development is to be interpreted as a single development of phenomenal actualizations arising out of a single, original integral, or whether it is not rather to be interpreted as a *series* of such Evolutions—each arising from its own peculiar integral. The first, or monophyletic view, is the one that has hitherto been most popular; the second, polyphyletic interpretation, is the one that is now more and more forcing attention because of the unique character of these so-called "emergences" which seem to be susceptible of no other interpretation than that which assumes them to be the product of "new syntheses" or "integrals" of potentials, and thus the expression of new creative acts.*

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*Simply because it is the unfolding (actualization) of the potentials latent in that integral—the true meaning of "Evolution."

But in order to appreciate the force of the argument, it will be necessary for us to consider these "emergences" at some length and see if we cannot discover the secret of their exceptional character.

The first important conclusion at which we have thus far arrived is that the particular emergences with which we are here concerned are emergences due to mathematical integrations of certain *antecedent actualities.* But even this is not all. Important as is the discovery that we are here dealing with mathematical integrations, with all which that fact involves (and its consequences are of vast significance), we have further to observe that even mathematical integrations may be of more than one kind. Thus, we have (a) mathematical integrations wherein the agent effecting the integration remains without or *external* to the product; and (b) mathematical integrations in which the agent effecting the integration becomes actually embodied or *incarnate* therein, as the dominant and controlling principle of the new synthesis. The uniting of hydrogen and oxygen to form water, as well as the numberless other "compounds" produced by synthetic chemistry in general, are common-place illustrations of the first; whereas the synthesis of a number of chemical and physical energies effected by the living agent in the green leaf of the plant, whereby the latter agent becomes "embodied" or "incarnate" in the product (*i. e.*, protoplasm) as its dominant and characteristic principle, is a sufficient illustration of the second. The distinction between these two kinds of integration is, we repeat, a most important one, though it is not commonly stressed. Heat, light, electricity, *etc.*, all play their part as important conditions in effecting ordinary chemical syntheses, but these conditioning energies are not, necessarily, embodied in the compounds which are produced, as the essential and dominating characteristics of the latter. Electricity is not an essential characteristic of water, even though it may have been the agent that caused the hydrogen and oxygen to unite. But life *is* the essential characteristic of protoplasm, and we know that it was also the agent which (in the illustration cited above) caused the synthesis of physical and chemical energies to take place. $CO_2+H_2O+NH_3+$ sunlight will not, of themselves, unite to form protoplasm. Already existent life—in the green leaf of the plant—must be brought to bear upon these energies to effect the result; but once this is done, it is discovered that this conditioning life principle has entered into the product—is, in fact, the essential or distinguishing principle of the protoplasm so formed. In the one case, then, the conditioning agent or agencies which effect the synthesis do *not* enter into the constitution of the product as essential principles therein whereas, in the other case, this "embodiment" or "incarnation" of the conditioning agent is the most significant fact in the whole process.

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*See Diagram at end of Chapter.

Leaving the discussion of these details for more exhaustive treatment in the next few chapters, we wish once more to stress the importance of recognizing these "emergences" as the products of true mathematical integration. In a vague manner this has been admitted by writers on this subject, but it does not appear that even those who so refer to them, fully appreciate the magnitude of the admission. Yet, either these "new syntheses" which are responsible for the emergences in question are to be explained as merely *mechanical aggregations* of the material particles or other units entering into their composition; or else they are to be explained as the products of a true *mathematical integration* of the non-material "potentials" of such material actualities. There can be no middle ground. As it is very generally agreed that they are not the former, the second hypothesis is alone in order. But even those who admit this fact—who realize that they are not mere mechanical aggregates or mixtures of material units existing in some kind of organization, but that they are genuine fusions of some kind—in short, true "wholes" (integrals) or "individuations" ("individuals"), involving an "infinite" (not finite) summation or integration, *etc.*, appear to be blissfully unconscious of the enormous significance of these very admissions, for to admit that they are mathematical integrations at all, is to admit the truth of all that is involved in the processes of integration and differentiation of quantities in the calculus. *But what is thus involved?* In answer to that question, we would say that a mathematical (as distinguished from a mechanical) integration of actual quantities, with concomitant differentiation (actualization) of new quantities (the actual emergences), means the reduction of one group of actualities to *zero* (*i. e., potentiality*), and the concomitant eduction of another group of actualities out of zero (potentiality) which means, in plain English, the *annihilation of matter* (*i. e., its reduction to zero or nothing—which is itself an act of infinite power*)—*with consequent creation of matter anew* (*i. e., its eduction out of zero or nothing—another act of infinite power*)—which is the very "miracle" of creation that theology insists does actually occur at these particular points (*viz: the "emergences" of life, mind, personality*), and which materialistic science (we do not say true science) has ever as strenuously denied. Either these writers, therefore, must admit the miracle of creation here, or they must seek, and seek in vain, to interpret these "emergences" in a purely mechanical manner—*i. e.*, in terms of mere material aggregations, synthetic mixtures, *etc.*, rather than in terms of true "wholes" (*i. e.*, integrals) or "individuations."*

Now Morgan, of course, fully realizes the distinction between simple mechanical syntheses, which may be explained as ordinary "resultants" of previously given factors and conditions in an antecedent development, and syntheses which cannot so be explained, and to which he has aptly given the name of "emergences". Nevertheless (despite these admissions) it is by no means clear that he really appreciates the true character of these latter, or the mathematical principle involved in their appearance. To elucidate the matter yet further, therefore, let us take the specific illustration, referred to in the last chapter, and examine it still more particularly.

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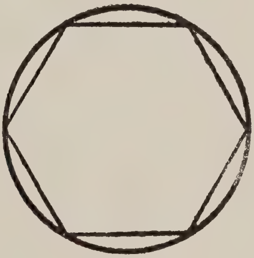
*It is precisely this "mechanistic" attempt to interpret life and mind that has always proved a failure; but our present day biologists continue to be handicapped by the obsession that it can be accomplished.

If the sides of a regular polygon, inscribed in a circle, be constantly doubled in number, with every step in the geometrical progression, the length of each side will be correspondingly diminished by one-half, and the perimeter of the polygon will constantly approach the circumference of the circle as its limit.

We are not here concerned with demonstrating the general truth of this theorem, which is well known to all, but only are we concerned with pointing out certain important consequences which that truth involves. For example, in the case of a regular hexagon inscribed in a circle (See figure)



it will be seen that as the number of the sides is increased by the ratio 2 in geometrical progression, we shall have the series—

6, 12, 24, 48, 96, ... ∞

That is to say, the number of sides will increase indefinitely toward the limit—*infinity;* and simultaneously—with every step in the progression—each side of the hexagon will be diminished by one-half its length, thus forming an inverse series progressing steadily to the limit—*zero.* To wit:

1, ½, ¼, ⅛, 1/16 0

The limit of the entire development, then, will be represented by the expression ∞ by 0, which signifies that the polygon will never attain its limit until the number of its sides becomes *infinite,* and the length of each *zero;* which means again, that this limit will not be attained until the polygon as such has been completely *annihilated.* (It being obvious that a polygon whose sides—straight lines—have no length, is not a polygon at all.)

In short, we may carry the series to any finite degree of development we please without changing the essential character of the polygon; for as every term of such development is "fixed" or predetermined by the "Logos" of the polygon, it is manifest that no matter how many the number of its sides, or how short each of them may be, the figure so "evolved" will continue true to the Logos of a polygon—that is, it will continue to be a plane figure bounded by "straight lines." But once let the development be carried (not to any assignable *term,* or "finite degree", remember, but) to its *limit;* —that is, once let the development be carried *ad infinitum*— and, instantly, the polygon is annihilated, and in its place we have a figure totally different *in kind* therefrom—*i. e.,* a figure with a wholly distinct Logos—the circle. In short, the circle does not differ from the polygon in degree, but in kind; it is not a polygon developed to an immense number of (finite) degrees—*i. e.,* a polygon developed to "the *nth* degree,"—not a "highly developed polygon"; but an altogether *different kind* of entity. That the circle is thus totally different in kind from the polygon (or variable which approaches it)—hence never to be regarded as a mere "evolution" out of the polygon (an expression of the polygon's potentials and dictated by its Logos), can be easily demonstrated from its very definition: for a circle is a plane figure bounded by a curved line, every point of which is equidistant from a point within called the centre; whereas, a polygon is a plane figure bounded by straight lines, and having no one point within, which is equidistant from every point in its perimeter.

We repeat, then, that the circle—the limit of the polygon's development—is *not* a figure which has been "evolved" out of the Logos of the polygon, but a figure with a totally different Logos which has been substituted for the polygon. The circle is, in other words, an "emergence"—an altogether "new synthesis" of potentials (*i. e.,* a new system or "logos" of potentials, hence, a *new creation.*

We arrive, therefore, at the following important conclusions:—

(1) Every term of a development is the product of the actualization of energy *latent in its integral,* such actualization being predetermined as to its appearance both in time and space by the Logos of said integral, so insuring "conformity to type"—*i. e. the conservation of the species.*

(2) The limit of a development is not a term thereof, but an entity differing *in kind* (*i. e. in Logos*) from the variable approaching it, and is not, in consequence, determined by the Logos of the development,—hence is not of the same species as the variable.

(3) No variable ever attains its limit, in finite time, through its normal process of development—that is, through the simple "evolution" or progressive actualization of the potentials resident in its integral, operating under the direction of its characteristic Logos; but

(4) Whenever a variable does attain its limit, in finite time, it is always in consequence of an *"interruption"* of this its normal process of development or Evolution, and the entire annihilation of said variable actuality as such; and

(5) Since it is obvious that this "interruption" of the developmental process, and consequent attainment of the limit, is not the result of any actualization of energy *within* the integral—operating under the direction of its Logos—it must, of necessity, result from the operation of some energy or energies without the development; in short, must be due to some cause *ab extra, i. e., transcendental to the Development;* which means again that

(6) No variable ever attains its limit in finite time through evolution (*i. e.,* through the operation of energies immanent in the developing material), but only through a metamorphosis effected by the operation of an energy *ab extra, i. e., a literal annihilation and concomitant creation ("death" and "resurrection") effected by a transcendental power.*

Finally, it is particularly important to note also, in this connection, that though the variable (*i. e.,* the polygon) can never, in any finite time, evolve its limit (*i. e.,* the circle), it, nevertheless, increasingly *simulates*—and so suggests, implies, or foreshadows— its limit (the circle) as its development continues. For it is obvious that the greater the number of its sides, the more "circular" or "circle-like" does the inscribed polygon appear, and a polygon of a thousand sides (could we construct it) would doubtless be indistinguishable to the eye from a true circle, though differing fundamentally therefrom. Now, as we shall see, it is just this deception of mere appearances that has misled many Evolutionists into believing that such "emergences" (*i. e.,* "limits") as plant, animal, and man, have been naturally "evolved" out of their respective antecedent developments. *Man, however, is no more a simple evolution out of the animal, than is the circle a simple evolution out of the polygon;* though it is quite true that as its evolution progresses, the animal increasingly simulates its limit, man, even as the polygon increasingly simulates its limit, the circle. It is just as erroneous, therefore, to speak of man as "a highly developed ape", as it is to speak of a circle as "a highly developed polygon." They belong to altogether distinct categories or orders of existence. In short, the "limits" of developments, are never "terms" thereof, but entities belonging to a *different sphere or region of existence;* hence with respect to the "developments" or "evolutions" in question,—"emergences," "new syntheses", "new creations." It is true, however, (supremely true, in fact, as we desire to emphasize) that these limits of developments are always suggested, implied, or foreshadowed by the developing variables, and it is unquestionably true that the higher animals—especially the anthropoid apes—distinctly suggest, simulate, and imply their limit—man. Man is to the animal, however, precisely what the circle is to the inscribed polygon, its limit; hence (for that very reason), he (man) is "a thing apart" an emergence—*i. e., a new creation.*

In our opinion, therefore, an emergence can no more be explained as the product of an evolution, than an integration can be explained as the product of a differentiation. The two processes are altogether antithetical, and the law governing the one process can never be invoked to explain the law governing the other; or—in other words—the "Law of Evolution" cannot, by any miracle of logic, explain the "Law of Emergence". That there is a continuous process of alternate differentiations and integrations, evolutions and emergences, (creations) to be seen in Nature, is true; but while such a process may be justly described as a *continuous Development,* it is not a *continuous Evolution.* Hence we believe in the continuity of cosmic Development, but not in the continuity of cosmic "Evolution." Evolution there is, undoubtedly; but it is not a continuous, uninterrupted movement. It has more than once been "interrupted" by "creative syntheses" or "emergences". It is polyphyletic and not monophyletic. One of the greatest mistakes science has made, therefore, lies in her failure to realize how great a role this principle of the *variable and its limit* has played in Nature. Not only in the attempt to explain the entire cosmic process as a single ,"uninterrupted" evolution has she met with insuperable difficulties; but even when the phenomena of emergences have so clearly antagonized her favourite interpretation, and demanded a reconsideration of the entire matter, she has persisted in underestimating the importance of such objections, and continued to search for an explanation not inconsistent with her fundamental assumptions. The hope is vain. These emergences are *limits,*—not *terms* in the various sequences or "evolutions" which lead up to them. For this reason, they can never be explained in terms of these antecedent evolutions themselves. The Law of Evolution can indeed account for all possible "terms" that may appear within its sequence, but never for the "limit" to which such sequence may approach indefinitely, but can never, *of itself,* attain. No process of mere Evolution can ever bridge the chasm—the infinite gulf—between a developing variable and its limit.

The reason is that the passage is not a finite, gradatory, evolutional process at all, but an *in*-finite leap or mutation from one order of existence to another; and such a passage involving, as it does, an act of infinite power and, simultaneously, the formation of a new integral, characterized by a different kind of Logos, is nothing more or less than an act of creation. Involving an act of infinite power, we say, for (note this carefully) *only infinite power can effect in any finite time, what it is admitted that a finite power working by finite, measurable, gradations, must take infinite time to accomplish.*

The passage of any variable to its limit in finite time, then, is *in itself* a manifestation of infinite power, and because it involves the "interruption" of the further progression of the variable under its "natural law"—the interruption of a law of Nature by a "transcendental power"—is a miraculous event.

If, then, these "emergences" are acknowledged to have taken place in finite time at all (which is obvious, inasmuch as they are assumed to have occurred in the course of geological history), and can further be proved to bear the relation of "limits" to their respective antecedent "developments", it can be mathematically demonstrated that *they are the creations of infinite, extra-developmental, or transcendental power.*

By Evolution, then, we understand the continuous, progressive actualization of the potentials resident in a given germ or integral—such progressive actualizations being pre-determined, as to their appearance in space and time, by the specific Logos or "complex ratio" of the potentials resident in said integral, which Logos remains constant throughout all the "formal" or phenomenal changes of the development.

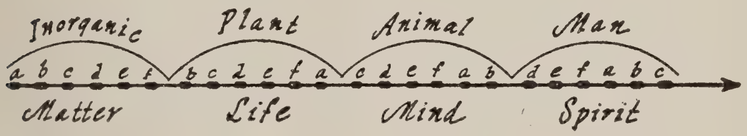
No transformation, therefore, which involves the reduction of one series of actualizations to corresponding potentializations (zeros), and the simultaneous eduction of an altogether new series of actualizations out of these same potentializations, but arranged in a new "system of relatedness" (*i. e.*, a system characterized by a new Logos)—whether such transformation be accompanied with the addition of altogether new potentials to the integral or not—can ever be characterized as a continuous process of Evolution, or explained in terms of Evolution at all. On the contrary, every such emergence is, self-evidently, a *new creation,* because it involves (1) a complete change of Logos; and consequently, (2) the formation of a new integral; (3) the annihilation of matter *per se* (*i. e.*, the reduction of actuality to nothingness, zero, potentiality) and its creation anew out of nothingness (zero or potentiality) in the appearance of new actuality; hence involves (4) the passage of the infinite gulf between the finite and the infinite—the passage from the finite material (actual) through the infinite immaterial or potential—back again to the finite material—hence, a passage involving an act of infinite power.

So much for the mathematics of Emergence. We must now consider the mathematical character of the developments which arise therefrom.

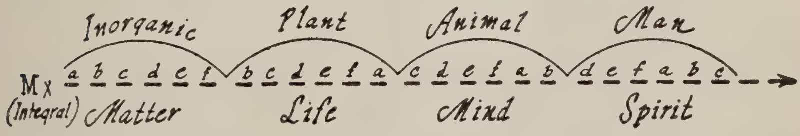
NOTE.

The following diagram may suggest our meaning more clearly.

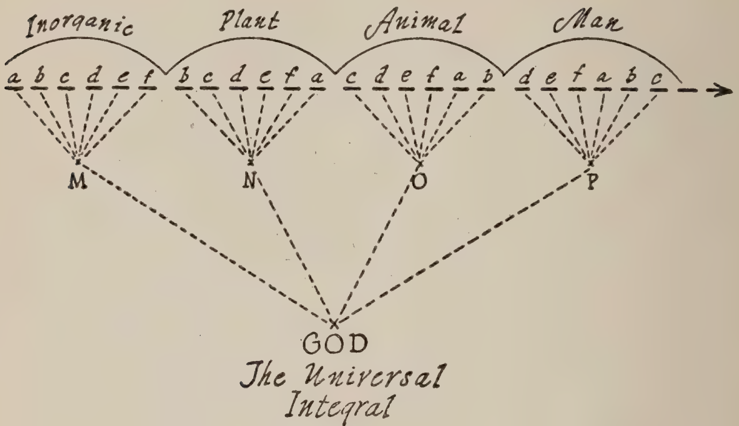
A. Here we have the popular view of the cosmic process—a single, continuous Evolution, represented by a straight line in which there are no "breaks"; the successive phenomena, *a, b, c, d, e, f,* being physically or materially interconnected, and all arising out of a common material unit, as the diverse manifestations of its own inherent potentialities. This view holds that matter *per se* contains within itself "the promise and potency" (Tyndall) of all that has since appeared in the process of cosmic development,—life, mind, spirit.


Inorganic
Plant
Animal
Man
a b c d e f
b c d e f a
c d e f a b
d e f a b c
Matter
Life
Mind
Spirit

B. Here we have a modified view of the common conception—a "broken" line, representing the dis-continuity of the material sequence, but still adhering to the main idea that life, mind, spirit, and all other phenomena are so many diverse actualizations of the potentials inherent in, and peculiar to matter *per se*.


Inorganic
Plant
Animal
Man
Mx
(Integral)
a b c d e f
b c d e f a
c d e f a b
d e f a b c
Matter
Life
Mind
Spirit

C. Here we have what we believe to be the true interpretation of the matter based upon the obvious implications of the grand "emergences" of life, mind, and spirit (personality)—*viz*: a series of distinct developmental systems—independent evolutions—each arising, epigenetically, out of its own separate and characteristic integral.—*M*, *N*, *O*, *P*.



It will be readily seen from the above, that our view maintains the existence of diverse orders of integrals—(an implication of the calculus which contemplates diverse orders of differentials, zeros, infinities)—and consequently regards each of the integrals, *M*, *N*, *O*, *P*, out of which the various developmental systems or "evolutions" arise, as themselves subordinate to the Supreme Integral of the universe—*God*.

It is to be remembered that our interpretation does not deny that the entire universe is "actualized," "differentiated", and so "evolved" out of the one Supreme Integral (a proposition we distinctly defend), but only does it deny that it has been so "actualized," "differentiated" or "evolved" out of the integral of *Matter* (*M*)—a very different proposition.

It may further be observed, as a kind of corollary of the above, that, in a secondary sense, Evolution itself may be regarded as a process of creation. That is to say, in the broadest and truest sense, creation includes or comprehends Evolution; for Evolution, as here understood,—(*i. e.*, the actualization of the potentials resident within a given integral)—is only an effect or consequence of the prior act of integration whereby the germ was formed and empowered to accomplish what it does. But for this very reason, it is obvious that integration is production (*i. e.*, creation) proper;—Evolution is merely reproduction—*i. e.*, secondary creation. While, therefore, in the final analysis, all that is "brought forth" or "evolved", may, in one sense, be said to be created, yet it is necessary for us to distinguish between these primary and secondary methods by which the Creator works in Nature, just as men have ever hitherto been accustomed to distinguish between what are called "primary" and what are called "secondary causes". Particularly it is necessary to stress this distinction in dealing with the issue here under consideration (*viz*: between science and religion), for there is all the difference in the world between these *secondary creations* of Evolution, which are confined to the actualization of a specific number of potentials resident within a given germ or integral; and those greater, *primary creations* whereby such germs or integrals have themselves been brought into existence and endowed with this very capacity for secondary creation—i. e., actualization or Evolution.

CHAPTER V

The Mathematics of Evolution

AS THE "new syntheses" which we have been discussing in the preceding chapter are not, in our opinion, any kind of mechanical combinations of material particles, but rather mathematical integrations of immaterial entities (potentials or zeros)—not new physical aggregations but mathematical integrals,—and as further, in our opinion, every material evolution is a development out of such an immaterial integral and not, as commonly supposed, out of a purely material germ, it is necessary before proceeding further with the argument to go to the root of this matter. What we mean to affirm is that the real *origin* of a development is not a material germ— *a unity of material particles,* "genes" or other "organic micromeres"—whose character and arrangement determine the nature of the subsequent development; but the real origin of a development is *an immaterial integral of potentials* ("potential energies"),the precise"pattern" or"rational arrangement"(Logos) of which is the real determinant or cause. In saying this we are not denying the existence of such things as genes, nor even that they exist within the chromosomes in definite systems, but we deny that any such systems of material micromeres constitute the real *source* or *origin* of the developments. In tracing the ontogeny of an organism back to its source, we have no more logical right to stop at chromosomes, genes, idants, ids, determinants, biophors, or any other minute particles of matter than we have to stop at the fertilized ovum. *It is the origin of the organic matter itself that is involved.* Every "origin" is a "limit". It is not a "term" of the developmental series which springs from it. In going back, therefore, to the real beginning or origin of the ontogenetic movement we can stop short at no assignable particle of matter however minute, for, to use the familiar mathematical expression, the origin here is "less than any assignable quantity" of matter; which is only another way of saying that it is beyond any and every assignable quantity of matter—*i. e., beyond matter itself.*

This principle has been demonstrated by the differential and integral calculus, and the significant point which we are here endeavoring to emphasize is that the developments of Nature follow the analogy of the developments of mathematics, just as Nature, in general, obeys mathematical laws, and can be expressed in terms of mathematical formulae—a statement which from the standpoint of physical science is well nigh axiomatic. Thus, it is well known that every mathematical development originates from an "integral" or "synthesis of zeros" (potentials) and is determined as to its precise character by the "relations" or "ratios" which exist among these zeros—the "prime ratios" of Newton. How zeros or pure nothings could have definite values, and stand in definite, calculable ratios, one with another, was for a long time a great puzzle to the mathematical world until the philosophy of mathematics brought to light the fact that "negations" of particular "quantities" were only "no things" ("nothings") with respect to those particular "quantities" (*i. e.*, "things) which they so negated—that, in short, they were relative nothings only, and in point of fact were genuine *entities,* belonging, however, to a totally different sphere of reality. To make a long story short, we have now discovered that *the universe is a system of regions within regions;* that there are diverse orders or spheres of reality, and that while, with respect to any given region of actuality, that which lies beyond its boundary, necessarily appears as a pure negation of it—hence as a nothing or zero in respect thereto—it is, nevertheless, a genuine reality though of a different order. Thus, the so-called homogeneity out of which every existing heterogeneity is said to evolve, is a homogeneity only as respects that particular order of heterogeneity which you are contemplating. Actually this homogeneity is a heterogeneity, but its specific differentiations do not belong to the same sphere or region of reality with which you are primarily concerned—hence, with respect to this particular sphere, it is an undifferentiated region. Applying the principle, then, we discover that the zeros or negations of particular quantities, are nothings only with respect to those quantities, and are, in truth, genuine entities of a different order of reality, and as such they stand in definite relations or "ratios" one to another, and these ratios can be definitely calculated.

The net result of the whole discovery, then, amounts to this. Speaking generally, the origin of any material actuality (because necessarily its specific negation or zero) is, for that very reason, an *immaterial potentiality* and to this immaterial potent entity or (simply) power we commonly give the name *spirit.* We know, then, that the origin of each, individual, organic development is an immaterial entity—an integral of potential energies—to which we give the name *soul;* and every material or bodily development that proceeds therefrom, is simply the progressive actualization in space and time of the potentials (*i. e.*, potential energies) resident in this immaterial integral. As already stated, these potentials or zeros always stand in definite relations or "ratios" one to another in the integral, and it will be readily seen that the form or "character" of the subsequent development is determined by this system. Each germ, in other words, contains its own definite "system" or "arrangement" of potentials—the Logos of the development—and it is this immaterial Logos that determines (both in time and space) the specific appearance and distribution of the actualized energies.

If this explanation should appear obscure, let us come to a definite concrete illustration of the mathematical principle itself. To show what is meant by the "ratios" existing between "immaterial potentials" in the integral of a development, let us take the familiar example of the calculus regarding the rate of variation of the area of a square to the rate of variation of its side. Let $y =$ area of square, and $x =$ side. Then we have

$$(1)\ y = x^2$$

If now we increase the side of the square, x, by a small amount dx, the area will likewise be increased by a certain amount which we may designate dy, and the new area $(y+dy)$ will be equal to the square of the new side—*i. e.*, $(x+dx)^2$; whence we have

$$(2)\ y+dy=(x+dx)^2$$

Carrying out the usual operations of the calculus, we have—

$$y+dy=x^2+2x.\ dx+(dx)^2$$

Eliminating the negligible $(dx)^2$, we have—

$$y+dy=x^2+2x.\ dx$$

Subtracting (I) $y=x^2$, we have—

$$dy=2x.dx$$

$$\text{Or } \frac{dy}{dx}=2x$$

Which means that dy:dx::$2x$:1.

But what is meant by dy and dx in this last proportion? To answer that question we must analyze the matter still further. Let us assume that at the beginning the side of the square was 10 ft. Then the area was 100 sq. ft. If now the side had increased to 11 ft., the area would have been 121 sq. ft., that is, it would have increased 21 sq. ft., hence the ratio of the increment of the area to the increment of the side would have been as 21 : 1.

Suppose, however, that the side of the square had only been increased to 10.1 ft., the area then would only have been 102.01 sq. ft.; that is, it would have *increased* only 2.01 sq. ft., and the ratio of the increment of the area to the increment of the side, would have been only as 2.01 : . 1 or as 20.1 : 1.

Suppose yet again that the side had only been increased .01 ft., that is to 10.01 ft., the area then would have been 100.2001 sq. ft., and the ratio of the increment of the area to the increment of the side would have been as 20.01 : 1.

It will be seen, then, that the smaller the increment of the side, the nearer will the ratio of the increment of the area to the increment of the side approach the limiting ratio 20 : 1;

but note—*it will never actually be equal to this ratio of* 20 : 1 *until both the increments dy and dx have been reduced to zero.*

Just as long as dx has any finite value whatever, dy will also have finite value, and the ratio of dy to dx will always be as 20 *plus* : 1. When, therefore, in very truth, we do reach the limiting proportion $dy : dx :: 20 : 1$, or, as we more commonly express it, $\frac{dy}{dx} = 2x$, dy and dx will then each have the value of *zero;* whence the expression

$$\frac{dy}{dx} = 2x \text{ becomes } \frac{0}{0} = 2x.$$

In short, the expression signifies that the true ratio of dy to dx—*the ratio which determines the whole development*— is not a ratio existing between any finite quantities in the development (a self-evident absurdity), but a ratio existing between the zeros, negations, or potentials of dy and dx which pre-exist (*i. e., before any development exists or is possible*) in the integral—the true "origin" of the development. The principle, when applied to any given organic development simply means that such development is not determined by the ratios existing between any *actualized particles of matter* (genes or other physical micromeres—however minute they may be conceived to be) but by ratios existing between the ultimate (*meta*-physical) potentials or zeros subsisting in the immaterial integral of the development.*

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*It is beyond the limits of this work to enter into a discussion of the philosophic significance of zeros. That zeros do differ in value, however, and stand in definite, calculable "ratios" one to another (whatever that may mean), is known to all mathematicians, and is set forth in many elementary text-books (*e. g.* Nicholson's *Algebra,* p. 140-142). The real meaning of this fact however, was long a subject of discussion—eliciting the famous witticism of Berkeley that, perhaps they were "the ghosts of departed quantities." Later discoveries concerning the diverse orders of reality in Nature, now make it plain that they are not absolute, but only relative "nothings"—*i. e.,* entities *of another order of existence* from that under contemplation. In the light of this explanation their "ratios" can be well understood and thus it develops—(to paraphrase the lines of the poet)—that it is not "imagination" only, but sober, scientific reasoning that

"bodies forth
The forms of things unknown. . . .
Turns them to shapes, and gives to airy nothing
A local habitation, and a name."

Again, suppose that instead of the equation $y = x^2$, we should take an equation like the following:

$$y = 7x^2$$

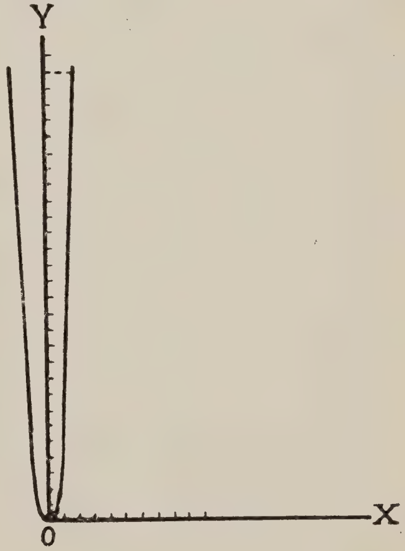
Differentiating, in the same manner as above, we find the differential coefficient in this instance to be

$$\frac{dy}{dx} = 14x \text{ which is again equivalent to } \frac{0}{0} = 14x$$

And in order to discover what kind of development is here pre-determined we have only to assign to x a set of successive values, running from 0, 1, 2, 3, etc, as far as we choose, and deducing therefrom the corresponding values of y, plot the figure by the method of graphs. Thus,—

If $x = 0$ $y = 0$
If $x = 1$ $y = 7$
If $x = 2$ $y = 28$
If $x = 3$ $y = 63$

If $x = -1$ $y = 7$
If $x = -2$ $y = 28$
If $x = -3$ $y = 63$



Again, let us assume that we had given the following equation—

$$y = ax^2 + b$$

What kind of development would here be indicated? Let us take a particular instance, assuming that $a = \frac{1}{4}$, and the constant $b = 3$. The equation then becomes—

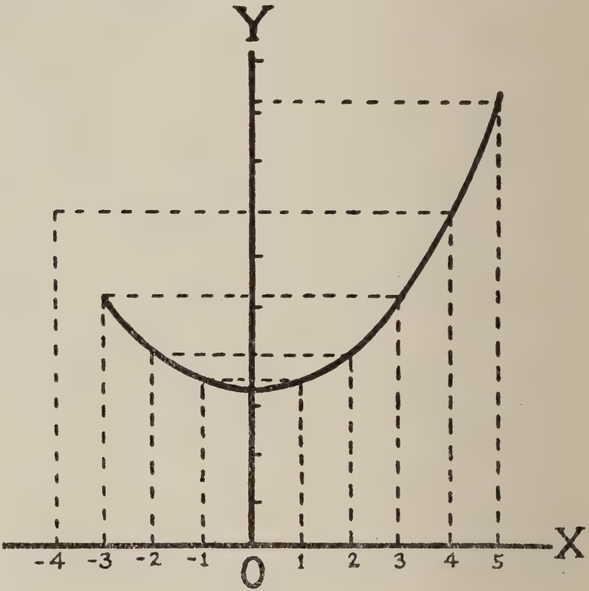
$$y = \tfrac{1}{4}x^2 + 3$$

And differentiating we get

$$\frac{dy}{dx} = \tfrac{1}{2}x$$

Now remembering that the constant b signifies that the first step in the development must begin at a certain point on the axis of y here indicated as 3, we lay off this distance,—assign a few successive values—(say from 0 to 5) for x, and plot the figure in the usual manner as follows:—

If $x = 0$ $y = 3$
If $x = 1$ $y = 3\frac{1}{4}$
If $x = 2$ $y = 4$
If $x = 3$ $y = 5\frac{1}{4}$
If $x = 4$ $y = 7$
If $x = 5$ $y = 9\frac{1}{4}$



We find, then, that the development here pre-determined by the differential coefficient $\frac{dy}{dx} = \frac{1}{2}x$ is also a curve, but one of a different slope altogether from that represented in the preceding illustration. In like manner we would discover, if we took the trouble to investigate it, that the differential coefficient of the equation $y = x + b$ is $\frac{dy}{dx} = 1$ and that this ratio determines a straight line that, originating at the height of b on the axis of y ascends therefrom at an angle of 45°.

To sum up the whole matter, it will be seen that any geometrical figure that may be conceived of as undergoing a development, whether it be a square, a cube, a curve, or what not, possesses its specific equation, and when we trace the development back to its *source* or true origin, we discover that the entire process has been predetermined, at every point, by the prime ratios existing between the potentials (zeros) resident in this its immaterial integral. That in spite of the fact that these zeros are not actualities or material entities (but, on the contrary, the specific *negations* of the actualities which evolve from them) that they are nevertheless the true "determinants" or "causes" of the development, dictating the appearance (both in space and time) of each and every physical actuality evolved. In a word, it can be mathematically demonstrated that it is the potent, immaterial integral that causes the actual, material or physical development—every detail of the latter—(whether of form, configuration, or distribution of parts in space and time)—all being pre-determined by the "complex ratio" (differential coefficient) existing between the potentials (zeros) latent therein.

Now, though a thousand times more complex, we have no good reason to doubt that all the organic developments of Nature are likewise mathematical developments—developments arising out of immaterial integrals and actualizing their immaterial potentials in specific physical forms or biological patterns under the dictation of their respective *logoi* (*i. e.*, systems of potentials—differential coefficients). In short, we have no reason to question the fact that every organic development is but "the outward and visible form" of an "inward and spiritual" reality (immaterial integral); that the material "body" is but the actualization, in time and space, of the immaterial soul of the organism, and that thus Evolution is "orthogenetic" and "rational," because always "conforming to type"; or (what is the same thing) always conforming to the "ratio" or "Logos" of its integral. It is this "Logos" or rational arrangement of the potentials in the immaterial integral, and not any mechanical combination of biological micromeres (genes, *etc.*) that is the real basis of heredity—that which insures conformity to type—and which pre-determines that out of a number of infinitesimally minute drops of apparently homogeneous protoplasm, one shall develop into the form of a starfish, a second into the form of a bird, a third into the likeness of a mammal, a fourth into the image of man. That the development of the simplest organism is, indeed, infinitely more complex than any of the mathematical developments here indicated, goes without saying, but there is no reason to believe that in principle there is any difference between the two. Moreover, it must be remembered that we have dealt with the crudest examples of what the calculus is able to devise, and that numberless far more intricate forms may be developed. The single principle of "derived functions", whereby through successive differentiations various "orders" of differentials may be discovered, is in itself sufficient to suggest the amazing fecundity of the principle.

Concluding this part of our argument, then, we may say that by the aid of mathematics alone, we are able to affirm that *the true "origin" of every material development is an immaterial integral of potential energies (potentials) arranged in a specific system of ratios (i. e. "a ratio-nal system") or "Logos"; which "Logos"—inasmuch as it determines the actualization in time and space of every potential in the integral—determines the whole "form" or character of the material development; and so the biological type.* This means again, that all Evolution is, at bottom, a *psychological* problem. It is the mind that gives existence, shape, and pattern to the body, not the body to the mind; and consequently it is the specific type of mind—*i. e.*, Logos—that determines whatever essential biological "forms" or "types" there be in Nature.

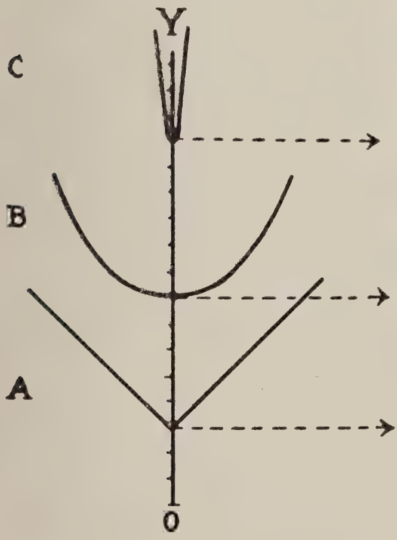
But let us now return to the more immediate subject of our investigations. Suppose we should arrange the foregoing examples of mathematical developments in such a manner that by addition of certain "constants" to the various equations, their corresponding graphs would appear physically connected—the entire group presenting the appearance of a single orderly system arising out of a common integral, and pre-determined by a single Logos: would this conclusion be justified in point of fact? Would the apparent explanation, be the correct explanation? To illustrate what is meant, let us take the foregoing equations, to wit—

$$y = 7x^2;\ y = \frac{1}{4}x^2 + b;\ \text{and}\ y = x + b$$

Suppose, now, that we should add a constant, b, to the first of these equations, and, after reversing their order, should give to b in the first, the value 3, in the second the value 8, and in the third, the value 14. The series would then read:—

$$y = x + 3;\ y = \frac{1}{4}x^2 + 8;\ \text{and}\ y = 7x^2 + 14.$$

Now by simply plotting the graphs of each of these equations, we find that they combine to form a single, continuous, tree-like figure; *e. g.*—



$$y = 7x^2 + 14;\ \frac{dy}{dx} = 14x$$

$$y = \frac{1}{4}\,x^2 + 8;\ \frac{dy}{dx} = \frac{1}{2}\,x$$

$$y = x + 3;\ \frac{dy}{dx} = 1$$

At first sight, this figure suggests to the eye a single, continuous development. That is to say, superficially, it might be imagined that the entire figure constituted the graph of a single equation—hence represented a material development originating from a single integral, and controlled by a single Logos. Actually, however, it is nothing of the kind. Actually it represents a series of independent "developments"—each originating from its own separate Integral, and evolving in accordance with its own peculiar Logos.

But while in this particular illustration the fallacy should be easily detected, yet there are many instances in Nature in which the transition from one species to another appears so gradual and so orderly that the mathematical metamorphosis ("mutation") is hardly discoverable. Thus, Mr. Herbert Spencer was singularly unfortunate in his application of the principle of conic sections to prove the natural "evolution" of one "species" from another; for the orderly succession of the various "species" of curves (circle; ellipse; parabola; and hyperbola) therein cited does not imply the "evolution" of any one from another, as he assumes, but, on the contrary, the process in question is *inexplicable* upon the basis of such an assumption. To understand Mr. Spencer's argument, we here reproduce his statement verbatim. "You admit that there is no apparent relationship between a circle and an hyperbola. The one is a finite curve; the other is an infinite one. All parts of the one are alike; of the other no two parts are alike. The one incloses a space; the other will not enclose a space though produced forever. Yet opposite as are these curves in all their properties, they may be connected together by a series of intermediate curves, no one of which differs from the adjacent ones in any appreciable degree. Thus, if a cone be cut by a plane at right angles to its axis, we get a circle. If, instead of being perfectly at right angles, the plane subtends with the axis an angle of 89° 59′, we have an ellipse, which no human eye, even when aided by an accurate pair of compasses, can distinguish from a circle. Decreasing the angle minute by minute, the ellipse becomes first perceptibly eccentric, then manifestly so, and by and by acquires such an immensely elongated form, as to bear no recognizable resemblance to a circle. By continuing this process, the ellipse passes insensibly into a parabola; and ultimately, by still further diminishing the angle, into an hyperbola. Now here we have four different species of curve—circle, ellipse, parabola, and hyperbola—each having its peculiar properties and its separate equation, and the first and last of which are quite opposite in nature, connected together as members of one series, all producible by a single process of insensible modification."*

But this "single process of insensible modification" is not responsible for the transition from the one order or "species" of curve to the other, even here, and the real process is not one of evolution, though it is a process of development. The fact that the ellipse succeeds to the circle, the parabola to the ellipse, *etc.*, does not prove that the ellipse has been evolved out of the circle, the parabola out of the ellipse; even though it be admitted that the succession of intermediate curves present no "appreciable degrees" of distinction, and the process appears to be one of insensible modification. To prove that the process is one of evolution (as distinguished from a "development," such as Agassiz would affirm), one must show that each of these "species" of curve, has been "derived" from its antecedent species by virtue of the same law or principle (*i. e.*, *Logos*) which determined every "stage" (or "term") in the evolution of this antecedent species. But this is precisely what *cannot* be shown. The Logos of the ellipse, for example, will determine all the intermediate curves, or possible "varieties" of ellipse, from the lowest and most "circular" up to the most "eccentric" and parabolic, but it will not determine the parabola or "limit" of the sequence itself. The equation of the ellipse will not, under any circumstances produce a parabola, and what is true in this instance, is true in all. The equation of the circle can never give us an ellipse, nor the equation of an ellipse give us a parabola, nor the equation of a parabola give us an hyperbola, yet the equations of each one of these species will determine all possible degrees of curvature within the species—*i. e.*, all possible varieties of that species, but never a new species. If, then in the revolution of the plane in question, we are presented with a sequence of distinct species of curves, each of which is characterized by a development of its own, governed by its own specific Logos, though we may affirm an orderly progression or

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***Universal Progress*. See Chap. "The Development Hypothesis," p. 385.

development of the whole series, yet it is obvious that we cannot affirm an unbroken or continuous Evolution. Mere orderly succession of events does not spell Evolution. It is only the "intermediate curves"—that is the "varieties" included within each species—that are obviously the products of its "evolution", for as these varieties are *all determined by the Logos of the species—differentiated out of its integral*—they are obviously nothing more than actualizations of the "potentials" (potential energies) inherent in the species—the product of energies inherent or immanent in its primordial germ or integral. On the other hand, the appearance of each new species, because it involves the interruption of the orderly progression of the antecedent "evolution", the violation of its Law of Development, and the substitution of a new integral, governed by a new Logos or arrangement of potentials, is necessarily the product of some agency external to that which was immanent in the antecedent evolution, an extra-developmental or transcendental, agency; and, in consequence, must be regarded as a new creation. We must not, therefore, allow ourselves to be misled by appearances, and conclude that because one species seems to shade into another by imperceptible degrees, that no further changes of a fundamental character are involved.*

Now, in our opinion, something closely resembling this is presented us in the spectacle of cosmic development, only that in this latter case, the matter is even more complicated. What we mean to say is that cosmic development is not, as commonly assumed, one continuous evolution originating in a material germ, and progressing undeviatingly in obedience to a single Logos; but, on the contrary, cosmic development presents us with a series of distinct evolutions, which though apparently derived one from another, are actually *independent systems, each the product of its own distinct integral, and determined as to its peculiar "form" or character by its own specific Logos.* In a word, Evolutionists have failed to appreciate the role which the principle of "the variable and its limit" has played in the process of cosmic development, and have been misled by appearances. This has been all the more pardonable inasmuch as the tendency of the variable to simulate its limit more and more as it continues to approach it, coupled with the further fact that the limit itself is seen to conserve in its integral the potentials of the antecedent development, conspire to render the deception so perfect as to make its detection well nigh impossible. In the first example just submitted, there should be no serious difficulty in discovering the error which, at first glance, suggests itself when looking upon the figure, for only a moment's reflection should satisfy any one that the graph of the curve opposite the letter B cannot be derived from the equation $y=x+3$, nor that opposite C from the equation either of B or A, and that, as a matter of fact, there is nothing indicative of developmental continuity beyond the superficial suggestion presented by the connecting line OY, which was produced by the sum of the constants. But there are other cases in which the deception is by no means so easy to detect or explain. Judging the problem solely by the eye, it is very difficult to convince one's self that the inscribed polygon cannot, through simple continuation of the finite process of development, be made to coincide with its limit—the circle—in finite time; and even Herbert Spencer, as we have just seen, was deceived into thinking that if the plane which cuts a cone at right-angles to its axis, forming thereby a circle at its intersection with the surface of the cone—could be made, simply through finite stages of continuous revolution, to diminish this angle, it would *evolve* (mark the word) first an ellipse, then a parabola, and finally an hyperbola; although he knew as well as any one, that each of these geometrical figures possessed its own distinct equation, and that by no miracle of logic could the graph of an ellipse be derived from the equation of a circle, or that of a parabola from the equation of an ellipse, or that of an hyperbola from the equation of a parabola; but that—in point of fact—each of these figures represented a distinct and independent "development"—each originating from its own specific integral, and controlled by its own peculiar Logos.

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*Like "the kingdom of God" (the greatest of them all) these emergences come not with observation (St. Luke xvii. 20).

To come, then, without further delay to the application of the principle, we say that just as it is mathematically impossible (despite appearances) to derive (or what is the same thing, "evolve") a circle out of the Logos of a polygon, or an ellipse out of the Logos of a circle, or a parabola out of the Logos of an ellipse, or an hyperbola out of the Logos of a parabola; so is it likewise impossible (despite appearances) to derive or evolve sentient life out of the Logos of non-sentient matter; percipient mind out of the Logos of sentient life; or self-conscious personality out of the Logos of percipient mind. We admit that *superficially* this derivation looks not only possible, but probable; because the two "orders" of phenomena appear to merge insensibly one into the other; and because again, the higher "emergence" undoubtedly conserves, or takes up into its own constitution, the potentials of the lower. Despite appearances, however, we know that a polygon of ten-thousand sides is *not* a circle, though to the eye it may be absolutely indistinguishable therefrom; and despite the fact that the circulators .142857 and .285714 have precisely the same digits, we know that neither one can be derived (*i. e.*, evolved) from the other. They are altogether distinct and independent "evolutions":—the one being "evolved" out of an integral whose Logos is the ratio 1 : 7; the other out of an integral whose Logos is the ratio 2 : 7. In precisely the same manner, we contend that these individuations, or as they are now more commonly designated "emergences"—life, mind, personality (plant, animal, man)—belong to wholly separate categories; are independent evolutions, each developing out of its own separate integral, and determined as to its character by its own distinctive ratio or Logos. That they cannot be accounted for upon any theory of "Evolution" or "derivation" one from the other, should be obvious inasmuch as they are conceded to be "new syntheses"—that is unities in which the potentials of the antecedent evolution are re-arranged into a "new relatedness", that is a new Logos, and so, self-evidently, cannot be the product of the antecedent Logos. In a word, no one of them can be explained as an "evolution" out of the Logos of the antecedent development; and even where the "new synthesis" contains no new potentials (and this is often the case), the fact that they are *new* syntheses—*new* combinations, *new* arrangements of the old, implies that some power external or transcendental to the former development has effected the transformation, as it is again self-evident that no power immanent in the former development and working ever in accordance with its characteristic Logos, could have produced the result.

CHAPTER VI

The Problem Of Species

IF then it be true that what are called emergences cannot be construed as the natural "products" of the respective "evolutions" or "developments" which are seen to lead up to them, but on the contrary, are evidently the work of extra-developmental agencies acting, from time to time, upon such antecedent developments—if, in short, we are brought to a view of organic development which pictures it as an alternating series of creations (*i. e.* germ or integral formations) and their consequent evolutions—we are naturally brought face to face with the further question as to how many such independent germs (integrals) with their consequent evolutions are to be found in Nature, and how are we to recognize these true phylogenic individuals, when we meet with them. Only a little reflection will assure us that these are the real species for which we are seeking, all other forms being merely so many different varieties or differentiations of these primordial types. Are we to identify them with any of the so-called sexually barred "species" of the older zoologists, or are they to be identified with certain far larger and more ancient phylogenetic groups, as Neumayr, Wasmann, and others have supposed? And if again, we are to accept the views of these last named authorities, by what characteristics precisely are we to recognize these greater individuals? Does each "class" represent such an individuality—can we identify them with the great "phyla" which appear each to have preserved its own separate existence from a remote geological antiquity? Nay, more, is it not possible that we may have to include in our conception even more comprehensive groups than these—groups based upon certain fundamental psychical, as well as biological characteristics? Now, before it is possible to answer such questions, we shall have to examine the whole problem regarding the meaning of "species" from a somewhat different angle.

To introduce the subject, we cannot do better than cite the following explanatory passage from Prof. Le Conte's *Evolution and Its Relation to Religious Thought.* "It is a most significant fact, to which attention was first strongly directed by Louis Agassiz, that the earliest representatives of any group, whether class, order, or family, were not what we would now call typical representatives of that group; but, on the contrary, they were, in a wonderful degree, connecting links; this is, that along with their distinctive classic, ordinal, or family characters they possessed also other characters which connected them closely with other classes, orders, or families, now widely distinct, without connecting links or intermediate forms. For example; The earliest vertebrates were fishes, but not typical fishes. On the contrary, they were fishes so closely connected by many characters with amphibian reptiles, that we hardly know whether to call some of them reptilian fishes, or fish-like reptiles. From these, as from a common vertebrate stem, were afterward separated, by slow changes from generation to generation, in two directions, the typical fishes and the true reptiles. So, also, to take another example, the first birds were far different from typical birds as we now know them. They were, on the contrary, birds so reptilian in character, that there is still some doubt whether bird-characters or reptilian characters predominate in the mixture, and therefore whether they ought to be called reptilian birds or bird-like reptiles. From this common stem, the more specialized modern reptiles branched off in one direction, and typical birds in another, and intermediate forms became extinct; until now, the two classes stand widely apart without apparent genetic connection. . . .Such early forms combining the characters of two or more groups, now widely separated, were called by Agassiz "connecting types", "combining types," synthetic types", and sometimes "prophetic types"; by Dana, "comprehensive types"; and by Huxley, "generalized types." They are most usually known now as "generalized types," and their widely separated outcomes as "specialized types." Thus in general, we may say that the widely-separated groups of the present day, when traced back in geological times, approach one another more and more until they finally unite to form common stems, and these, in their turn, unite to form a common trunk. From such a common trunk, by successive branching and re-branching, each branch taking a different direction, and all growing wider and wider apart (differentiation), have been gradually generated all the diversified forms which we see at the present day."*

From this very clear exposition of the matter, it should be apparent that there are, in one sense, as many "races" as there are primordial, synthetic types; that races, so to speak, comprehend races; and that, in the final analysis, all these must ultimately be embraced in one or more truly original or primal types, which are not themselves comprehended as specializations within any higher racial developments. This means that in every really complete developmental system, there are but three constant factors to be considered—(1) The original or absolute type; (2) A number of relative, synthetic types, included under and derived from the original, as special differentiations thereof; and (3) the ultimate specialties derived, in turn, from these. It will also appear that inasmuch as the entire process has been one of progressive differentiation or specialization out of an original synthetic unit, the two leading ideas in every such developmental system are the ideas of the *synthetic* (the original unit) and the *special* (the ultimate unit), or as Von Baer expressed it, the *general* and the *special*, all the relative synthetic units constituting the second category, though important, being nevertheless secondary, intermediate and transient in relation to these. But again, it should also be observed that while in consequence of these considerations, Von Baer was led to formulate his famous definition of development as a process by which the *special* was differentiated out of the *general*, he was very unfortunate in the selection of this latter word to designate the original term of the series, which comprehending, as it does, the potentials of all the subsequent specialities derived from it, might, with far more appropriateness, have been termed the *synthetic*. Aside, too, from the fact that the term *general* is utterly inadequate to express either the original and synthetic character of this primal factor of the entire process, its manifest affiliation with the words *genus*, and *genera*—all involving in some way the idea of diverse "kinds" of objects—renders it altogether inappropriate and misleading in this connection. It was in view of these considerations that Prof. John McCrady, many years ago, declared that the world generally had been misled by Von Baer's dictum that the special had been derived from the general, and in asserting that, on the contrary, both the general and the special were themselves derived from the synthetic, claimed by the introduction of this new factor into the problem to have cleared up much confusion of mind concerning a matter which at the time was a subject of great discussion.

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*Pp. 11-13.

In a word, his contention was that a general term merely signified a class of special objects all possessing some common mark or characteristic. It was, in fact, a conception based upon the re-iteration or pluralizing of a given special. All specialities possessing the same marks or characteristics are of the same *kind* (genus)—hence of the same *general class.* Moreover, to use his own language, "*generality*, properly so designated, has nothing whatever to do with *origin.*" Again he writes, "it had become plain to me that any generality could be converted into a speciality by eliminating the notion of repetition, and conversely, that any speciality would be converted into a generality by simple repetition. Moreover, that any term of a sequence might be treated as a relative synthetic in regard to the terms derived from it, even while it held the relation of a relative speciality to the terms preceding, whence itself was derived. . . .Development is that operation of force by which the *special* and the *general* are educed from the *synthetic.*" Now it was just this idea that was emphasized by Neumayr in his "palaeontological species" and by Wasmann in his "natural species".*

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*It is just this idea which underlies various polyphyletic interpretations referred to in Chap. I., of which recently (*i. e.*, since the above was written) has been defended by Austin H. Clark of the Smithsonian Institute. Dr. Clark stands squarely for the separate origin and independent development of each of "the major groups" (*Quarterly Review of Biology,* Dec. 1928).

It is just this idea also that underlies the undeveloped theory of Owen. This great anatomist did not hesitate to express his belief in a certain kind of "derivation" or "descent" of existing species from certain original *archetypal forms* which, because they held all the potentials of these later specialized types, corresponded to the true mathematical species of which we are here speaking. What he sought to impress upon us was the danger of all over-zealous attempts to derive existing species one from another, and the wisdom, on the other hand, of attempting to explain the enigma of derivation solely by study of pre-existent "synthetic types." That such types, which Owen refers to as "archetypal forms", do exist in the geological record, is well known, but, in the light of our present knowledge, their number is not sufficiently determined, and the lines which diverge from them are not sufficiently clear, to justify any certain conclusion as to the details of the process—especially in answer to the question whether Evolution has been monophyletic or polyphyletic. Wherever such synthetic types can be shown to exist, however, and wherever any existing species can be shown to be nothing more or less than simple specializations thereof, we may venture the theory of genetic derivation or Evolution, but always with the proviso that there is nothing actualized in the specialized type that was not potential in the synthetic; that is to say, always with the understanding that all the attributes of the former can be reasonably accounted for as potential in the latter. Wherever this cannot be done, and wherever, especially, we come across forms displaying characters (whether physical or mental) utterly inexplicable in terms of any combination of potentials in the antecedent type—wherever, in short, we come across distinct "emergences," we must admit that they can logically be explained only on the principle of "creation."

Now science has been very careless in regard to these matters, and in attempting to work out a classification of the animal kingdom based upon the true evolutional or genetic relation of the various groups, the most remarkable diversity of opinion has resulted. As we have already pointed out, Darwin did not believe in any monophyletic theory of evolution, such as Haeckel later advanced, and expressed himself as amazed at the boldness of the latter. On the contrary, following the well known classifications of Cuvier and Agassiz, he declared his belief in the absolute independence of such groups as Vertebrata, Articulata (Arthropoda), Mollusca and Radiata, though he admits the possibility of the latter being further subdivided. "I believe," says he, "that animals are descended from at most only four or five progenitors, and plants from an equal or lesser number." And while he confesses that analogy might lead him one step further to assume the common origin of all plants and animals, yet he adds—"analogy may be a deceitful guide." It is well known also that his colleague, Alfred Russell Wallace went even further in declaring that because of the unique intellectual and moral characteristics of man the latter should also be separated from the rest of the animal kingdom—an opinion which Dana, Mivart, and many other of his contemporaries likewise endorsed, and which has never ceased to have its defenders even to the present moment. But it is not merely with the unique position of man that we have to deal. The entire monophyletic scheme of Haeckel has undergone considerable bombardment during the past few decades. Steinmann denies the common origin of the Monotremata, the Marsupialia, and the Placentalia. Oscar Hertwig recognizes seven altogether distinct and independent groups or systems of development. Boaz asserts that there are nine, Fleischmann that there are sixteen, Kennel that there are seventeen, while very recently Dr. Austin H. Clark, of the Smithsonian Institute, has boldly asserted that "there is not the slightest evidence that any one of the major groups arose from any other," and that so far as concerns these groups, "the creationist seem to have the better of the argument."

Many other similar statements might be adduced. But why this great confusion of thought? Why, after all the years devoted to the careful consideration of the matter should there be such diversity of opinion regarding the affinities of the various groups? The answer is that while, in a general way, the study of comparative morphology—upon which most biologists rely for evidence—does throw great light upon the problem of the genetic relations, it is not, *in and by itself alone,* adequate to solve the enigma, and in the hands of superficial investigators it has often led to most erroneous conclusions. Thus, it is well known that varieties of the same species often present morphological differences every whit as great as those characterizing individuals of wholly distinct species, and while this fact has led our better trained systematists to "base their classifications mainly on what they regard as basic or homologous structures, in contradistinction to superficial or adaptive characters," yet "both kinds of structure . . are purely somatic, and somatic characters. . .are not, by themselves, a safe criterion for discriminating between varieties and species. . .Moreover, the distinction between homologous and adaptive structures is often arbitrary and largely a matter of personal opinion, especially when numerous specimens are not available."* The truth is that the real *causes* of structural plan or pattern lie deeper—they are incarnate in the germplasm, and even there they are not to be found, as geneticists fondly imagine, in any specific arrangement of the genes, but in the *psychical character* of the organism which, in turn, creates this "specific arrangement." In short, the genotype itself is but the expression of the "logos" (psychotype) of the immaterial integral which is alone the cause and the director of the whole material development. A little reflection on what has already been said—and which we shall presently discuss at still greater length—concerning the analogy which exists between organic developments and mathematical developments will suggest our meaning. It is the immaterial integral which is the cause of every material development—it is the immaterial Logos of this integral which predetermines the appearance, both in space and time, of each successive "term" (physical increment) in the whole "epigenesis." In a word, we affirm that it is the spiritual character, or mind of the organism working orthogenetically (but always under the limitations imposed by the environment) to express or embody its distinctive "Logos" that determines the form or true biologi-

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*O'Toole, *Case Against Evolution,* p. 121.

cal type. Due to the influences of the environment this essential type may manifest itself in numberless variations—morphological "varieties" of the type—but however diverse may be these adaptive characters, or however constant may be their appearance through long intervals of time, they are nevertheless but varieties or "species" (specific modes) of a single psychological type. Whatever the number of the fundamental biological groups may be, then, they are precisely the same as the number of the psychological types which produce them—precisely the same as the "orders" of mind in nature. Each such "order" may, indeed, have many representatives. That is to say, precisely the same type may be represented not only in many individuals, but even in many races of individuals, and these, in turn, may differ *inter se* in many marked secondary or adaptive characteristics, but the actual number of distinct orders of mind—of distinct psychological types—are few, and it is these few which constitute the great "emergences" "creations", "new syntheses", "integrals" or "origins" of their respective "evolutions". Briefly, they are the integrals which have given rise to the three fundamental forms of life—*plant, animal, man.* We are content to leave to the future the solution of the further question, whether within these groups again, Evolution has been monophyletic or polyphyletic; and if the latter, as to how many have been these original, independent phyla—how many the so-called natural or palaeontological species.* Whatever may be the ultimate answer to this question,

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*We venture the prediction, however, that when once these palaeontological species are discoverd, their phylogenies will reveal a complete cycle of sexual development beginning with (1) Asexual reproduction (fission, spore-formation, *etc.*) or its analogue (spontaneous egg or $2x$-cell development). ("An egg may function as a spore, in that *it may germinate without fertilization.*" *Coulter—"Evolution of Sex in Plants,"* p. 127) and proceeding through, an intermediate stage of (2) self-fertilizing hermaphroditism, until the climax of the differentiation is attained in (3) true sexual reproduction. It is well known that the present sexual distinctions have arisen (by differentiation) out of a former stage of hermaphroditism, which last was in its time, the result of a long process of differentiation having its origin in the "spontaneous" development of a single cell, spore, or egg functioning as a spore. Every true palaeontological species or primordial type must have undergone this complete cycle of sexual evolution in the course of its phylogeny. We propose to discuss this matter further on.

the point which must first be considered necessarily concerns the precise nature or character of the mutations involved. How are we to know whether a given mutation be evolutional or non-evolutional in character? That there are mutations which are consistent with the idea of Evolution, there can be no doubt; but that every instance of mutation can be explained in terms of Evolution, is far from true. And here we may remark that so-called "discontinuous Evolution" is really a contradiction in terms. Evolution, as we have shown, is synonymous with descent—*i. e., genetic continuity*—so that an evolution that is not continuous, is a derivation or descent from certain ancestors, without genetic connection therewith, which is absurd. Moreover, the *essential* character of the parent must be transmitted to the offspring, however the latter may vary from the former with respect to minor, unimportant features. In short, while it is true that the offspring always varies from the parent to some extent, and while it is further true that in many cases (sports, *etc.*) they may vary in marked degree from the normal type, yet to suppose that an organism, through any powers *inherent in its own nature, native to its own germinal constitution,* could, by virtue of these resident forces or potentialities alone, produce something *totally different in kind therefrom,* is obviously inconceivable. No integral (germ) can actualize (evolve) anything that is either contrary to its fundamental character (*i. e.,* its Logos—the arrangement of its potentials)—or beyond the capacity of such potentials. Whatever is actualized (evolved) out of it, must of necessity, conform to its essential nature. There is a limit of variation, therefore, which is not consistent with the idea of "descent" or "evolution", and where such mutations as these occur—leaps from one order of integral to another—they cannot be accounted for in terms of Evolution at all.

To appreciate the nature of these limits within which all variation must be confined if evolutional continuity is to be preserved, we cannot better illustrate our meaning than by employing that very useful and instructive invention of Sir David Brewster known as the kaleidoscope. As described in the New International Encyclopedia this instrument "consists of a tube containing two plane mirrors placed lengthwise along the axis and hinged together along one edge, so as to make with each other an angle which is an aliquot part of 180°. One end is supplied with an eyeglass, and the other is closed by two glass plates, at a small distance from each other, and between which are placed little fragments of glass or other colored objects. The eye looking into the tube perceives these objects multiplied as many times as the angle which the reflecting planes make with each other is contained in the whole circumference of a circle, and always symmetrically disposed. The slightest shaking of the instrument produces new figures, and it is not only a pleasing toy, but has been used to suggest designs and patterns," *etc.* Now if we would compare the mechanism of the kaleidoscope with the constitution of a living germ, we might liken the bits of colored glass in the one to the potentials in the other, and the mirrors set at definite angles, which prescribe certain limits to the numerical combinations of these bits of glass, to the "Logos" of the germ. In the light of such an analogy, it would appear that any appreciable change in environmental conditions (here represented in the shifting of the position of the instrument with respect to the external force of gravity,) would result in some alteration in the relations of the bits of glass, and the more marked the change in environmental conditions, the greater the diversity of pattern that would result.

In this way, numberless variations of form — numberless varieties could be accounted for on the simple principle of the continuous "readjustment" of a fixed number of "potentials" to changing environmental conditions. It is obvious, however, that the new "varieties" or combinations of form, resulting from this principle could never exceed a certain limit prescribed (*a*) by the number and color of the bits of glass (*i. e.*, the number and specific character of the potentials inherent in the integral); and (*b*) the specific angle of the reflecting mirrors (*i. e.*, the Logos of the corresponding species). For example, if in a certain kaleidoscope the bits of glass manifested only the colors red, white, and blue, and the angle of the reflecting mirrors was set at 60°, it would be clear that no varieties of design could possibly appear that included the colors black, green, or yellow, and the totality of the repetitions of any relation amongst the colors red, white, and blue, would be limited to six times the number of these objects. If now on picking up the kaleidoscope again, and examining its designs we should discover such new colors, appearing in twelve-fold, rather than six-fold repetitions, we should immediately conclude that we were looking into a different instrument altogether. Nay, more! Even if the *same* colors re-appeared, but repeated twelve, ten, or some other number of times, we would be forced to conclude that this was a new instrument altogether, distinguished by an entirely different Logos, for we would rightly argue that no shaking of the former instrument—no change in environmental conditions—could ever produce such combinations therein. In short, it is self-evident that a given instrument can produce no variety of design or pattern *beyond a certain number and kind prescribed by the character of its own internal constitution.* Now precisely the same law or principle applies to the number and character of the "variations" which a true organic species may exhibit under the influences of changing environment. Many "varieties" may be produced, but they are all *varieties of that species;*—they never transgress the bounds of its specific character, *i. e.*, the limits prescribed by the essential Logos and potentials peculiar to the species. It is simply inconceivable that a given set of potentials, operating under a fixed Logos, can produce either a new order of potentials or a different kind of Logos. Yet this is precisely what is supposed every time we assume that a new species has been "evolved" out of the integral of an old species. This would be to get more out of a thing that is in it,—to actualize or evolve out of a given integral more than is potential therein. It involves the absurdity that an effect can be greater than its cause. On the other hand, if the agency that affects the new "synthesis" of potentials is not inherent in the very nature of the old integral, the new species is not "evolved" therefrom at all, but is the creation of an agency altogether foreign to the old integral—an agency not within but *without* the antecedent development, an extra-developmental agency.

Applying the principle, then, to the palaeontological record, we find this difficulty confronting us in the many instances of the abrupt appearance of new species and types. Even assuming the principle of "mutation" in some sense to be true, then, and to afford the only satisfactory explanation of the abrupt appearance of many new forms in the geological past, it still remains to be solved whether these new types were the result of mutations occuring within the limits prescribed by the Logos of the antecedent types—and so the product of an Evolution; or whether they *exceeded* these limits, and are, consequently, to be accounted for only as the products of special creations. Or again, if a middle position be assumed, and it is contended that both kinds of mutation have actually taken place at different times, how are we to distinguish them—*at what points have we continuous Evolution through mutation, and at what points new creations?* This is the nut which Evolutionists have to crack. Now whether or not any solution of the problem in its details is possible in the present state of our knowledge—whether as regards the majority of these new types the evidence favours the theory of an Evolution rather than a Creation, and so, in the main, favours a monophyletic rather than a polyphyletic view of the general organic process; yet certainly there are three points at least in the general course of universal or cosmic development where the conditions of the problem render the supposition of evolutional continuity completely out of order, and where the hypothesis of a special act of creation can alone account for the phenomena presented. These three remarkable events to which our attention is to be particularly directed, during the next few chapters, are, as already stated, those great turning points in the course of cosmic development characterized by the emergence of *life*, the emergence of *mind*, and the emergence of *personality*. The justification for this last assertion lies more, indeed, in psychological than in purely physical considerations, but—as we hope to demonstrate in the further course of the argument—it is to the psychological rather than the physical factors that we must inevitably turn, if ever a scientific interpretation of the cosmic process is to be attained.

CHAPTER VII

Creation vs. Evolution

WE are now in a position to summarize our own view of the matter in a more constructive form.

Evolution is the unfolding (*evolvere*—to unroll), differentiation, or actualization of the "potentials" (potential energies) resident in a given germ or integral.

Creation is the enfolding ("involution") or integration of potentials into the unity of a new integral or germ, (a "new synthesis").

Creation is concerned with the *formation* of a germ or integral; Evolution with its *development*—*i. e.*, with the actualization of the potentials already latent in such germ or integral.

Creation logically antedates Evolution, for it is obvious that the germ must first be formed before there can be any actualization or evolution of its potentials.*

Creation necessarily implies the operation of *incoming, centripetal, and so—"transcendental" energy.* Evolution implies the operation of *outgoing, centrifugal, and so "immanent" energy.*

The cosmic process is not a continuous, uninterrupted Evolution, as is commonly supposed, but rather a series of alternate integrations and differentiations, creations, and evolutions;—the actualized differentiations or specializations of given evolutions being, at certain intervals, reduced to potentiality, and these "potentials" (*i. e.*, potential energies) simultaneously rearranged into new combinations or "systems" ("Logoi") with changed "ratios" (or relations between the potentials), only that from out of these "new syntheses", germs, integrals, other evolutions of a wholly new order ("emergences") may, in turn, arise.

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*See note at end of this chapter.

The integral or germ of an emergence, though it may (*a*) comprehend potentials altogether new and peculiar to itself, also (*b*) incorporates the potentials of the antecedent evolution, but always re-arranged into a new "Logos" or "system of ratios" which constitutes the specific character or "individuality" of the new development.

The power that so re-arranges the potentials of a given development into a "new synthesis" or integral endowed with a distinct and characteristic "Logos" of its own, is never *inherent* (immanent) in the development, but always *transcendental* thereto—(*i. e.*, operating upon the development *ab extra*), so that the "new synthesis" is never to be interpreted as the simple product or natural outcome of the antecedent development, but an altogether "new creation" wrought by the integrating influence of an agent *ab extra.*

This most important principle will be easily understood by the following illustration, which will also suffice to give the gist of our entire argument. The circulating decimal .142857′ 142857′, *etc.*, is a normal development of what is potential in the ratio 1 : 7. That is to say, the common fraction 1/7 may be regarded as the integral out of which the whole series of figures has developed; thus—

$$1/7 = .142857142857142857, \textit{ etc.}$$

Now it is obvious that every term in this series is *prescribed* or predetermined by the Logos or ratio of potentials inherent in the integral. Nothing can be actualized which was not already potential in the germ or integral. It is, therefore, a true

Evolution (unfolding or unrolling) of what is latent within the germ—all its actualizations are the result of energies *immanent,* and there is no need of invoking the aid of any *extra*-developmental or *transcendental* agencies to account for the result. Moreover, as with the principle of life, the "reproduction" of its essential "image" or "type" can be continued indefinitely, as it were "from generation to generation", for the same *formula* (*viz*: the cycle .142857) will continue to be "reproduced" unfailingly, as far as the development may be carried. If, therefore, we should ever come across a long series in which this same formula or periodicity should be seen to be operative from the very outset; and if, further, it should be observed that from beginning to end no other figures than those entering into the composition of this formula occurred anywhere in the series, we should, in all probability, come to the conclusion that the whole progression was a *normal, uninterrupted* Evolution out of the integral 1/7. For example, if we should be presented with the following—

.14285714285714285714285714285712857142857142857142857428571. . . . . .

we should not unnaturally assume that the whole progression was a normal evolution out of the integral 1/7. Only very careful examination would disclose the fact that after the 37th figure —though precisely the same digits continue to appear—the *periodicity* has changed, and the series can no longer be accounted for as an evolution out of the integral 1/7; that, on the contrary, this normal evolutional sequence has, for some reason, been suddenly "interrupted", and an entirely new cycle inaugurated—an evolution determined by the fraction 2/7. This means again, that a *new factor* has suddenly entered *ab extra*—an additional 1/7 has *re-arranged* the ratio of potentials —a *new integral* (*i. e., a "new synthesis*") has been formed, and as the result of this new creation or "emergence" *an entirely new cycle of Evolution has been inaugurated,—viz*: the cycle .285714′ 285714′, etc. Note particularly also, that this new cycle of development, while it is the outcome of an entirely different integral, and can, therefore, in no way be accounted for in terms of the Logos of the former integral (1/7)—hence, in no way explained as an evolution therefrom—contains, nevertheless, precisely the same elements (*i. e.*, the same figures) that appeared in the former cycle, and is, in this sense, unquestionably related thereto. What has changed is not the "elements" themselves but their "arrangement", and this new arrangement ("new relatedness") has been effected, not by Evolution—not as the result of the continued actualization of the potentials resident in the old integral, operating under direction of their characteristic "Logos" (*i. e.*, the ratio 1/7) —not, in other words, as the effect of any causes immanent in the former development—but in consequence of an external agent, a factor *ab extra,* which, by entering in, has entirely metamorphosed the "ratios" of the old Logos, creating an entirely *new integral,* endowed with a *new Logos.* Moreover, it will further be observed, if we examine the matter attentively, that with the sixtieth figure in the series, a *third cycle* of evolution is begun—this time the product of an integral represented by the fraction 3/7, showing that still another factor has been added to the integral from without.

Now, it is our contention that in the development of the cosmos a spectacle, closely resembling the above, is presented us. Undoubtedly, this process also appears (on the surface) to be a continuous, uninterrupted Evolution, springing out of the integral of non-living, unconscious matter, and directed and controlled at every step of its progress by the Logos of such matter. For it must be freely confessed that living protoplasm and all its products (alike in the case of plant, animal, and man) is composed of *precisely the same chemical elements* that enter into the constitution of the non-living mineral;* the vital processes also are undoubtedly closely *associated* with chemical changes and reactions, and even the "intelligent" acts, responses, and adaptations of all organisms, not excepting man himself, can, apparently, be accounted for in terms of unconscious automatic movements, mechanical reflexes, and tropisms. In spite of these appearances, however, closer inspection demolishes this interpretation of the matter. *Life* cannot be explained in terms of physico-chemical energies and reactions; nor can *perception* (mind), or *self-determined volition* be accounted for in terms of mechanism. With the appearance of each of these phenomena a new factor ("potential") is injected (*ab extra*) into the integral of the antecedent development, and a new Logos, "synthesis", or "arrangement of potentials" takes place, with the result that a new type ("emergence") is produced, which nonetheless retains all the "potentials" of the previous development.

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*Just as precisely the same digits entered into the three entirely distinct cycles noted above.

Thus, at a particular stage in the development of inorganic matter, a new unit of potential energy (vital energy) is injected into the integral of purely physical and chemical energies, with the result that a "new synthesis" is formed—a "*biosynthesis*"—whence a new order of development originates—the evolution of life, that is of plant (or more correctly) *aneuronic life*.* At yet another point in the evolution of this life again, a potential energy of yet higher character is injected into the integral of living matter—*viz*: psychical energy (mind, anima, or soul-energy)—with the result that there is yet another "synthesis" or "re-arrangement of potentials"—a "*psychosynthesis*"—whence originates a new development of still higher order—"*neuronic*"* or *animal life*. Finally, at still another point in the evolution of this animal life, a potential of yet higher order is injected into the integral of animal life—a unit of spiritual energy is "inbreathed". Again a "new synthesis" takes place —a "*pneumasynthesis*"*—and the evolution of self-conscious, self-determining, human life begins.

With this principle clearly in mind, and following the analogy of the circulating decimal indicated above, we might represent what has actually taken place in the course of cosmic development as follows:—

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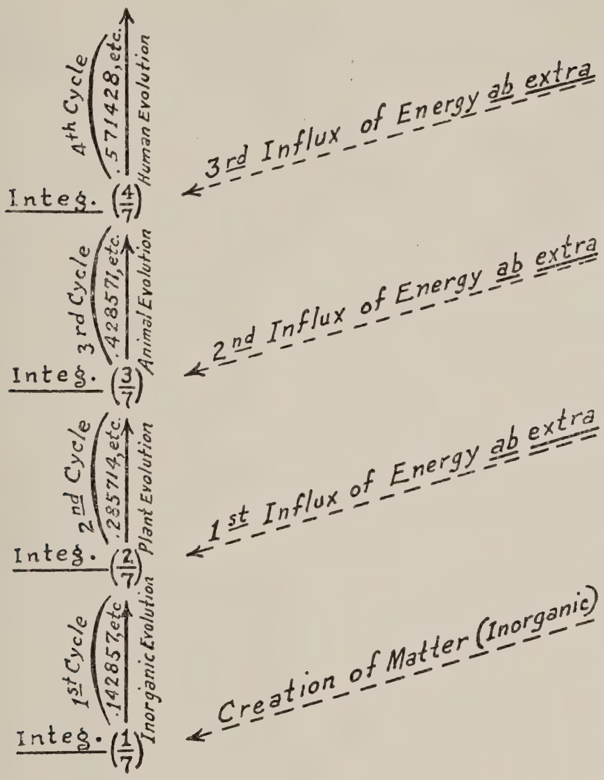
*The significance of these terms will be duly explained as we proceed. For the sake of a brief outline of the problem, we are here anticipating a number of matters which will be discussed at length in the following chapters.


4th Cycle
.571428, etc.
Human Evolution
Integ. (4/7)
3rd Influx of Energy ab extra
3rd Cycle
.428571, etc.
Animal Evolution
Integ. (3/7)
2nd Influx of Energy ab extra
2nd Cycle
.285714, etc.
Plant Evolution
Integ. (2/7)
1st Influx of Energy ab extra
1st Cycle
.142857, etc
Inorganic Evolution
Integ. (1/7)
Creation of Matter (Inorganic)

So far, then, as organic development is concerned, our general position amounts to this:—

Within the sphere of organic development, there have been *three distinct acts of creative power, manifested in the emergences of life, mind, and spirit* (*personality*) *respectively.* This means that the *aneurobia*—*i. e.* nerveless, vegetal organisms, including the unicellular organisms generally, plants proper, and plant-animals (zoophytes);—the *neurobia* (all true multicellular organisms below man possessing some kind of centralized nervous system); and the *phronetobia* (organisms possessing "*phroneta*" or thought cells and mechanisms in the cerebrum, represented by man alone); constitute *three wholly distinct categories—i. e. independently created groups.*

Whether each of these three groups, in turn, has been evolved from a single, original germ, or from a number of such primordially created germs;—that is to say, whether within each of these groups, Evolution has been monophyletic or polyphyletic is, in our opinion, an open question. With the exception of the third which we strongly believe to be monophyletic, we hesitate to express any unqualified opinion. Thus, while we incline to the view that the Aneurobia are likewise monophyletic, there are features of the problem which render this conclusion questionable. Only in the case of the Neurobia, where we are confronted with a number of independent groups—the long noted distinctions of Vertebrata, Arthropoda, Mollusca, and Echinodermata (which can be traced in all their essential features, even back to Silurian and Cambrian times)—are we strongly impressed with the idea of separately created types.*

Again, even within these independent phyla, we must also reckon with the possibility of multiple origins, but here the evidence is by no means so strong. It is not impossible that each of these great divisions has evolved from a single, original form, and constitutes, therefore, a true palaeontological or natural species, while the many subordinate "syntheses" ("synthetic types") which occur within each, and give rise to the classes, and other lesser differentiations, represent profound (evolutional) "mutations" within the species (*i. e.*, the "natural species"), brought about in adaptation to great changes in the physical environment. To revert once more to our illustration of the kaleidoscope, we might assume that a number of these instruments differing essentially among themselves with respect to their potentials (the number and color of the glass bits) and their Logoi (the angles of their reflecting mirrors) should represent the essentially distinct "natural species", whereas the manifold diversities of form or pattern which each of these instruments is able (under the limiting conditions of its essential Logos and potentials) to manifest in adjusting or adapting itself to pronounced external influences of the environment (*e. g.*, the "shaking up" or "turning over" of the instrument) would represent the various subordinate "types" and "morphological species" of the systematist.

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*Even then, however, the existence of the Trochophore in the developmental history of so many of these forms strongly suggests some common ancestral organism—the hypothetical Trochozoon. See Chart.

Of course these last conclusions are speculative only. What we really desire to emphasize as all important, is that at least three great manifestations of creative power, involving the fundamental emergences of *life*, *mind*, and *spirit* (*personality*) must, in any event, be recognized, and their far-reaching significance in relation to the theory of evolution be duly understood.* A glance at the accompanying chart will render more clearly our conception of this process of organic development.

Space forbids our entering more exhaustively upon the many problems which present themselves in connection with this interpretation of the process of organic development, but a few words of explanation are necessary to bring out the significance of the chart, and to indicate some of its more important implications.

First of all, it will be readily seen that (from this point of view) these diverse types (plant, animal, man), have no evolutional connection one with another, but have severally come into existence as the result of as many integrations wrought by external or transcendental agencies. To be more explicit, the advance of Nature, as a whole, has not been due to the evolution or differentiation of any one of these types or integrals, but to the periodic appearance (through integration or creation) *of successively higher and more perfect types*—to wit plant, animal, man. *Cosmic advance, in other words, is the result of successive creations* (*integrations*) *or emergences of higher and higher types,*—not of the continuous evolution (differentiation) of any one type. There is, of course, what might be termed a relative advance to be noted within each type, but such "ad-

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*We have already quoted the words of Lloyd Morgan on this point, *viz*: that "such emergence of the new *is now widely accepted* where life and mind are concerned" (*Supra.* Italics ours).

vance" is never beyond the "limit" of the potentialities latent in the integral of that particular type, nor, even within these limits, is Evolution always upward. There is, in fact, both *anagenesis* and *catagenesis*—some branches going upward, some going downward. Evolution within each type may be compared to the growth of a tree; the successive differentiations or specializations of the process (the branches of the tree) do not all go upward. A few only proceed in this direction, the rest in various directions, some more or less horizontally, and some distinctly downward. Thus in the type of the Aneurobia, it is only the so-called plant-animals that have tended to grow upward—the true plants have gone backward. Indeed, according to Prof. Cope, "Plants are the degenerate descendants of protozoan animal ancestors." Whether this particular interpretation be true or not, there is much evidence to show that they have undergone *degeneration*—that they have died that animals might live.

Within the cycle of the Neurobia again, the same law is repeated. It is only the Vertebrata and, to a less extent, the Arthropoda, that have developed upward. The Mollusca, Echinodermata, Tunicata, *etc.*, have degenerated. Even within the cycle of human development the same law is apparent. We know little of man before the dawn of the historic era, but the contrast between the high class Cro-Magnon and the low class Neanderthal, and other races, is again apparent evidence of the same thing: while within the historic period, it is notorious that only the white, and to a limited extent, the yellow race have advanced—the rest, and especially the negro race, having tended downward.* Comparing each of these great types to a tree, it may be said that there has been a general growth or increase in bulk of the whole tree, but there is no evolution of one grade of tree into a higher grade of tree—of one type into another and greater type. In short, the only progress in Evolution within each of these types, has been a progress in differentiation and specialization—progress from

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*This *anagenesis vs. catagenesis* is a phase of that polarizing (plus and minus) movement which is everywhere apparent in Nature. All existence is an expression of polarity.

the relatively simple to the more complex, from the relatively unspecialized to the more specialized, from homogeneity to heterogeneity—but always again *within the limits of the type.* There has been no progress, through Evolution, from type to type, from one grade or order to another and higher grade or order. Progress from type to type, grade to grade, order to order, has been by successive creations (emergences) not by Evolution; by successive integrations, not by continuous, uninterrupted evolutions. With this most important and essential qualification, we cheerfully adopt LeConte's figure of the tree as an illustration of the process. "A growing tree branches and again branches in all directions, some branches going upward, some sidewise, and some downward—anywhere, everywhere, for light and air; but the whole tree grows ever taller in its higher branches, larger in the circumference of its outstretching arms, and more diversified in structure. Even so the tree of life, by the law of differentiation, branches and rebranches continually, in all directions—some branches going upward to higher planes (progress), some pushing horizontally, neither rising nor sinking, but only going farther from the generalized origin (specialization); some going downward (degeneration), anywhere, everywhere, for an unoccupied place in the economy of Nature, but the whole tree grows ever higher in its highest parts, grander in its proportions, and more complexly diversified in its structure.* Very good! Very true! "The whole tree grows ever higher in its highest parts, grander in its proportions, and more complexly diversified in its structure," *but it never grows into another kind, or higher order of tree.* Using the word, "tree," then, in a metaphorical sense, we would say that the "tree of plant life" grows and expands ever more by differentiation and specialization, even as LeConte says, but it never grows into the "tree of animal life, nor does the "tree of animal life", in turn, ever grow into the "tree of human life." One grade or order of "tree" never "grows" or "evolves" into another and higher grade or order, however much it may continue to grow by differentiation and specialization, within its own type or grade;—however, in other words, it may continue to "unfold" or "evolve" the potentials latent in, and peculiar to, its own specific integral. There is no Evolution from type to type—from one integral to another and higher integral—for Evolution is *per se* only the unfolding of the potentials within a given integral. Advance from one integral to another, and different kind of integral—from one type to another and higher—*is by successive acts of creation.*

**Evolution and Religious Thought,* p. 14.

The above view (or something closely approximating it) was common among the older scientists who, though opposing the particular Darwinian interpretation, nevertheless maintained a certain theory of "development" which they rightly claimed to be consistent with the evidence both of geology and palaeontology. Thus, Dana while emphasizing the fact that the "Law of Specialization—the general before the special—is the law of all development," also points out that this "unfolding of a type" through specialization, was "not necessarily attended with much rise in grade." That while there may be "some little elevation in after time", there is often "a fall below the level of the early advance."* Owen also held "to the production of many modern species by modification, chiefly in the line of degeneration from older and more perfect types."§ Owen's view will be found in his *Com. Anatomy of Vertebrates,* Vol. III., Chap. XI. A similar view, though based upon very different evidence, is now engaging the attention of certain recent writers on genetics, According to Bateson, what Evolution there is appears to be the result of the *loss* or *suppression* of certain factors common to the original type, rather than by the acquisition of new ones. Such views, however, are not popular with the orthodox school. Of course the general fact of "degeneration" as a concomitant factor in the process, is familiar to all Evolutionists, and has even been emphasized as necessary to a proper understanding of certain phases of the problem, but we nevertheless believe that its widespread character and true significance has never been fully appreciated by the present school of Evolutionists. This is seen by the very attitude of present-day biological opinion toward all developmental theories similar, in general out-

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***Geology,* pp. 598, 599.

§Osborn, *From the Greeks to Darwin,* pp. 219, 220.

line, to those of Dana, Owen and Bateson. There is little sympathy, for example, with the idea that the savages of the present day may be the degenerate descendants of a higher stock, although in numbers of instances it is generally admitted that the evidence tends that way; little sympathy for the view that the agglutinative and monosyllabic tongues may be but the worn out remnants of primitive synthetic and inflected languages—although such a supposition is plainly in line with the conception of Evolution as a process from the synthetic to the analytic (*i. e.*, a process of differentiation and specialization out of the undifferentiated and unspecialized); little sympathy with the idea that polytheism may be, for a similar reason, the product of an earlier monotheism; pagan mythology the half-forgotten, disfigured reminiscence of higher and more spiritual truths—the disintegrated remains of a former revelation (for which the evidence is not merely considerable, but actually astounding, to those who have the patience and the tolerance to investigate matters so utterly opposed to their own pre-conceived opinions)* little sympathy, in general, for the notion that the chem-

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*"Were the conception of a god only an evolution from (such) spirit worship, we should find the worship of many gods preceding the worship of one god, polytheism would precede monotheism in each tribe or race. What we actually find is the contrary of this, Monotheism is the first stage traceable in theology. . . . . .Wherever we can trace back polytheism to its earliest stages we find that it results from combinations of Monotheisms" W. M. Flinders Petise—*Religion of Ancient Egypt*, p. 4.

Many other authorities could be quoted to the same effect:

To the student of religion nothing could be plainer than the tendency to degenerate in matters of worship from the plane of the spiritual to the plane of the material. Spiritual life and worship is, at the beginning, simple, instinctive, unreflecting. Then, it becomes rationally embodied in forms, ceremonies, institutions. So far Evolution is advance—Anagenesis. But after Maturity and Middle age (following the analogy of individual development) senescence, degeneration, and disintegration set in. Rational and embodied religion becomes formal and traditional. Formalism and traditionalism in Worship, soon lead on to literalism, ritualism, mechanism; and then, in time, as the process continues, sink into idolatry (*i. e.*, worship of mere forms and symbols) and superstition—in short, paganism. The law is universal. Indeed, this tendency to degeneration in spiritual life is so strong and so wide-spread that the whole ingenuity of religious leaders is concentrated on the problem of how to prevent it. But this means that the tendency in religious evolution, generally, is always downward (the tendency "to fall") nor is there any indication of the reverse process (*i. e.*, of Evolution out of fundamental idolatry to spirituality) in the realm of religious development. Why then assume that the higher has *evolved* out of the lower? The doctrine of successive "emergences," however, may lead to a very different conclusion.

ical elements may be the "ultimates" rather than the "principles" in the process of Evolution; the inorganic the outcome of the organic, the non-living the product of the living; unconscious matter the effect rather than the cause of consciousness; —*the whole physical cosmos the creation of a metaphysical conscious will or intelligence,—i. e., matter the self-objectification of spirit, rather than the reverse.* Yet this truly Copernican or heliocentric theory of the cosmos is inevitably bound to supersede the present universal, but logically indefensible Ptolemaic or geocentric interpretation which has already seen its day, and is hastening to its close.

In conclusion, then, we repeat the statement already made that one of the greatest mistakes of modern science has been its failure to realize the part which the principle of *limits* has played in Nature—especially in the phenomena of *developments.* All theories which ignore this principle and attempt to explain the cosmic process in terms of a single, uninterrupted Evolution are necessarily doomed to failure. Nor is this all. Even where, from time to time, the principle has been vaguely recognized, its true mathematical and philosophical implications have never, apparently, been suspected. Yet this principle of the *variable and its limit* involves the whole problem of the "miraculous"; and if once it can be shown that it has played a role in Nature, the reality of the "miraculous" in Nature, follows as a mathematical certainty. For science, philosophy, and theology alike, therefore, its significance can hardly be overestimated. It is the purpose of the following pages to point out some of the conclusions to which it leads us.

PRINCIPLES

1. The Law of Development involves simultaneous differentiation and integration, analysis and synthesis.

2. But these cycles of differentiation and integration, analysis and synthesis are themselves of *diverse orders,* and failure to recognize this fact, with consequent confounding of the cycles of one order with those of another, has been the cause of great confusion of thought. Thus, for example,—

3. The cycle of aneuronic development, *in its totality*, is, indeed, a single polarisis (*i. e.* of differentiation and integration), but within the field of this single polarisis, there are comprehended numbers of subordinate polarizations. (Even as every molecule of the magnetized bar of iron is supposed to be an independent magnet).

4. It is these subordinate polarises which constitute the diverse "species" within the "type".

5. But again, there are diverse "orders" of these species, in turn,—an hierarchical system—the earlier species of each type being relatively more unspecialized than the later.

6. When the limit of the development is approximated, the species are said to become "elemental" or "ultimate".

7. The inter-fertility of species varies with the degree of their differentiation one from another—the earlier and less differentiated being more or less fertile *inter se*, while the later, or more highly differentiated, become less and less fertile *inter se* until absolute sexual isolation is at last attained. These last constitute the "true" species of the old zoologists (*i. e.* sexually barred species).

.8 *No species by sheer continuation of the normal developmental process, in any finite time, ever attains its limit;* but the evolution of a species may, at any point in finite time, be brought abruptly to a close.

9. Any species—whether relatively unspecialized, or approximating ultimate specialization—when thus destroyed—hence annihilated as an actuality—is, in consequence reduced to zero or potentiality, and may (under certain circumstances) have its "potentials" re-arranged into a *new synthesis* (Logos) whence originates a "*new species*"—an "emergence".

10. When a given type has actualized all its potentials, and so reduced to zero, these "potentials" (which include the potentials of every species within it) are re-arranged into a new "system"—*i. e.*, "new synthesis" or "Logos"—whence origiates a *new type* (emergence of types).

CHAPTER VIII

The Emergence of Life

As already stated in the preceding chapter, whatever the actual number of "emergences" which have taken place in the course of cosmic development, there are at least three that call for more than usual consideration because of the remarkable character of the changes involved. The first of these occurs at the transition from the non-living to the living, which may, for convenience, be called the *emergence of life;* the second, at the transition from what, in popular parlance is usually designated plant life, to animal life, but which from the psychological point of view, is more correctly described as the transition from aneurobic to neurobic organisms (*i. e.*, from organisms devoid of a nervous apparatus to those which possess some kind of centralized nervous system)—the *emergence of mind;* while the third is that involved in the wonderful leap from animal to man—the *emergence of personality.* Because these unique "emergences" are synonymous with what are called "new syntheses" (*i. e.*, new integrations of potentials), they may again, for convenience, be described as, respectively, the phenomena of biosynthesis, psychosynthesis, and pneumasynthesis. Moreover, as the operation of agencies which are extra-developmental or transcendental to the evolving material is, in every instance, necessary to explain the phenomenon, and as agencies which are necessarily beyond, transcendental to, and altogether distinct from the matter which they invade, are, self-evidently, immaterial, metaphysical agencies, it follows that *these emergences can only logically be accounted for as the creations of immaterial, transcendental power.* What we mean to say is that, aside from all theological considerations, the mere fact that physical science has completely failed in its attempt to derive either life or consciousness from non-living, unconscious matter—even the *possibility* of such a thing being declared by some of the greatest authorities in science to be inconceivable (which, indeed, is nothing less than self-evident), it is obvious that we are compelled to assume the existence of immaterial, metaphysical agencies as the only rational way to account for the mystery. Indeed, under the circumstances, further refusal to accept such an hypothesis, can only smack of an *odium anti-theologicum.* It is no longer a question of why we should assume such entities, but why we should not assume them. What other reasonable or scientific hypothesis is left us? Life and mind have certainly "emerged" in the course of cosmic development. They are obviously "resultants" too large for the material components which enter into the problem. If therefore we cannot logically evolve them out of these material entities—if we cannot explain them as the simple products of physico-chemical forces, then, there is nothing else to do than to assume that they are immaterial, metaphysical agencies which have entered or invaded the material evolution from without. It is not a question of religious prejudice—it is simply a question of honest scientific reasoning which admits of no other conclusion.

Without further discussion of the general matter, then, let us proceed directly to a careful consideration of the facts surrounding the first of these strange "emergences"—the *emergence of life.* While it was a very common opinion in ancient times, that living beings were, in some mysterious manner, spontaneously produced out of non-living matter, yet there is no supposition that has now been more thoroughly exploded by later scientific research. We cannot here review the interesting fluctuations of opinion which took place during the epoch of Redi and Harvey, of Buffon and Needham and Spallanzani, of Schultze and Schwann, of Cagniard de la Tour, Helmholtz, and others. It suffices to say, however, that ever since the memorable experiments of Dr. H. Charlton Bastian were conclusively shown to be erroneous by Tyndall, Pasteur, and others, this ancient theory of spontaneous generation has been universally abandoned. Indeed, the epoch making demonstration of the falsity of this idea, coupled with its corollary that "all life proceeds from or out of life" (*Omne vivum ex vivo*), has been the watchword of modern biology, and the basis upon which the whole science of bacteriology has been erected. But while the "germ theory," as it is popularly called, owes its origin in large measure to those very experiments which proved to the satisfaction of the scientific world that spontaneous generation was not supported by a single known fact of Nature, yet with curious inconsistency, the principle so thoroughly repudiated in this direction, was later revived in another, the moment that its untoward consequences to a materialistic conception of cosmic Evolution began to be realized. If *omne vivum ex vivo* is an inviolable principle—if life has always been derived from life, and never from non-living matter, *then, obviously, there has been no evolution of the living out of the non-living; cosmic evolution has not been an "uninterrupted" process, and a miracle occurred with the entrance of life into this world.* Only the assumption of an "influx" of some metaphysical influence could account for the strange "emergence". This would never do. While, therefore, it was impossible to revive the now thoroughly discredited theory of spontaneous generation, or to justify the general idea of abiogenesis, in any form, as a possibility under the normal conditions existing to-day, yet might it not be true that in the very different conditions which doubtless existed in the dim geological past, such an event might then have taken place? True no one has ever been able even to imagine any combination of physical conditions that could logically account for such an event, but nevertheless such dreams have continued to be popular, and because of the remarkable development which the science of synthetic chemistry has recently undergone in the manufacture of some of the most highly complex organic, though non-living, substances (the sugars, starches, alcohols, *etc.*) the hope has once more been revived that the truth of the speculation might yet be demonstrated in the actual manufacture of living protoplasm in the laboratory. But although much money has been expended, and the highest technique of the specialist has been repeatedly employed, we are as far from the realization of such a dream as ever. The so-called "artificial protoplasm" of Butschli, Quincke, Jacques Loeb, *et al,* is a most interesting illustration of the extent to which the expert chemist may go in mechanically reproducing some of the movements and processes generally characteristic of living matter, but after all is said and done the substances so produced are no more living organisms than the life-like figures of the cinema are living men and women. Nor does the most enthusiastic exponent of the theory pretend that they are. Nay more, if the truth must be told, the results of these experiments, as well as the evidence obtained from other methods of approaching the problem, have only served to increase the difficulties which beset this hypothesis, and—as one of the greatest of our American biologists has expressed it —"*the study of the cell has on the whole seemed to widen rather than to narrow the enormous gap that separates even the lowest forms of life from the inorganic world.*" That, indeed, "the magnitude of the problem of development, whether ontogenetic or phylogenetic, has been underestimated."*

But while there is not one shred of evidence supporting the supposition that the living has been or can be derived from the non-living, there is, on the other hand, direct, unimpeachable and abundant evidence of the non-living being derived from the living. Sixty years ago, Dr. Lionel Beale, pointed out the significant fact that while only about one-fifth the bulk of an organism was really living material, yet from this one-fifth all the remaining matter originated. That is to say, the truly living portion of an organism is confined to what Beale called its "bioplasm", a substance which altogether constituted only about one-fifth of the entire bulk of the body. All the remaining four-fifths, consisting of organic and inorganic compounds, was *non-living* and demonstrably *the product of the activity of the living bioplasm.* Thus it can be shown that all the non-living structures of the body are the direct products of bioplasmic, or as we more commonly designate it to-day, protoplasmic activity; all those numberless non-living substances, organic and inorganic, which are produced by plant and animal organisms, are produced by this active living material. Thus, we find life producing such non-living substances as the sugars, starches,

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*Prof. Edmund B. Wilson, "*The Cell in Development and Inheritance*", p. 434.

gums, resins, alcohols, *etc.;* the bones, teeth, horns, hoofs, nails, claws, beaks, *etc.;* the shells of the mollusks; the coral rock, reefs, and islands built by the Actinozoa; the flint produced by the Porifera; the immense beds of carbonate of lime deposited by the microscopic Foraminifera; the vast deposits of phosphate, coal, lignite, peat, and even oil, iron, clay, and numberless other non-living substances. Again, not only have we all this indubitable evidence of the direct production of these (and numberless other) non-living, organic and inorganic compounds by agency of life, but we can further see these "compounds" in turn breaking down or disintegrating into their constituent elements—carbon, oxygen, hydrogen, nitrogen, sulphur, *etc.*, and even the atoms of these elements disintegrating into electrons—units of electrical energy. In short, we have direct, indubitable evidence of the production of the non-living from the living—nay more, of *a continuous, uninterrupted process of catagenesis, proceeding from living protoplasm downward through non-living organic, inorganic compounds, and elemental matter even to the very limit of material existence itself in immaterial energy.* But while we can easily trace the process *downward* from the living to the non-living, all attempts to begin at the other end and trace it *upward,* break off abruptly at the very threshold of life. But again, while the non-living cannot of itself evolve into the living, yet (mark the significant fact) the living may and does, on the other hand, stoop down, as it were, from above, and lift the non-living to its plane. Thus, while it is impossible for the non-living of itself to evolve into the living—while there is no evidence of such a thing anywhere in Nature, and all our attempts to effect this result artificially in the laboratory have decisively failed—yet, on the other hand, we see the already living plant constantly lifting the non-living to its own level—constantly converting the non-living CO_2, H_2O, and NH_3, into living protoplasm. The significance of these facts is clear and unmistakable to all who wish to see them. It simply means that life stands as the beginning and the end, the alpha and omega of the entire cycle of changes. That out of the living proceeds the non-living,—only, when it has attained its limit of differentiation or specialization, to be taken up or re-absorbed once again by the same agency which produced it. In other words, as long as we assume that life is the natural outcome of the non-living—that the lower "evolves" the higher—we meet with inevitable failure and contradiction, and for the very natural reason that no cause can ever be less than its effect. If, however, we will only reverse the process, and explain the *lower* in terms of the *higher* as logic itself demands—if we only assume that life itself is the creating and sustaining energy of the whole cycle—literally the *heart* of the circulatory system of the cosmos—the whole problem will be solved.

Moreover, what is true as regards the physiological side of the problem is true also as regards its psychological side. We have no evidence whatever of consciousness evolving out of unconscious reflex activity, whereas the reverse process of conscious acts slowly degenerating into unconscious, automatic activity is a familiar experience of every day life. Moreover, sentiency—or whatever degree of mind we choose to attribute to the lowest forms of life—is no more explicable in terms of chemical reactions, or molecular vibrations, than is a circle explicable in terms of a polygon. In speaking of the abrupt appearance of consciousness in man and the higher animals consequent upon a series of supposed molecular changes in the brain, Tyndall long ago asserted that "the passage from the physics of the brain to the corresponding facts of consciousness *is unthinkable*".* Again, "I do not think he (the materialist) is entitled to say that his molecular groupings, and motions, explain everything. In reality they explain nothing. The utmost he can affirm is the *association* of two classes of phenomena, of whose real bond of union he is in absolute ignorance. The problem of the connection of body and soul is as insoluble, in its modern form, as it was in the pre-scientific ages."§ And what is true of this attempt to explain consciousness in terms of "molecular groupings and motions," is equally as true of all later attempts to explain it in terms of atomic groupings or motions. In anticipation of this attempt again, Tyndall further remarked, "Phosphorus is known to enter into the composition of the human brain, and a trenchant German writer has exclaimed, '*Ohne Phosphor, kein Gedanke!*' That may or may not be the case; but even if we knew it to be the case, the knowledge would not lighten our darkness."* So also Prof. E. D. Cope, in more recent years, and after an exhaustive study of the subject, repudiates all such suggestions as absolutely preposterous. Says he, "The attempt has been made to identify hunger, for instance, with chemical energy, a proposition which is simply irrational."§

**Scientific Materialism, Frag. of Science,* p. 420.
§Id. p. 421.

That a certain *association* may exist between particular conscious experiences and specific chemical or physical conditions is quite another matter. This point, admitted by both of the above writers, we also cheerfully concede. But the invariable association of two events, by no means necessarily implies that one is *caused* by the other, or that the one can be *explained* in terms of the other. It is just here that the whole fallacy lies hidden. The attempt to explain either life or consciousness in terms of mechanism—whether physical or chemical, molecular or atomic, is—as Tyndall says—"unthinkable"; and it is unthinkable or inconceivable, we add, simply because (as already explained) both life and consciousness are the *limits* to which mechanism or mechanical evolution tends, but which it can never reach through the "natural law" of its own development, but only as the result of the "miraculous interruption" of that natural law and process by the descent into it of *a higher form of energy*, from above, which instantaneously "transmutes", and by an infinite, inconceivable (unthinkable) *leap* ("mutation") lifts it into another and higher kind of entity. Life, in other words, is not a higher "term" in the "sequence" of phenomenal stages exhibited by the development of non-living energy, so that the same natural law of that development which determines the term *a* (inorganic compounds) and the term *b* (non-living organic compounds), likewise determines the term *c* (living protoplasm); but it is the *limit* of the development, and as such, is, of course, not *any* term of the development, fixed by its natural law, however far the process be carried. It belongs to another category of existence altogether. If it were simply a higher term of the same development whose natural law determines the formation of inorganic and organic compounds, it could be produced in accordance with that law, synthetically, in the laboratory. But the fact is that no operation carried out under this natural law has ever yet produced it, and when we come to examine the problem carefully we find it inconceivable (*i. e.* "unthinkable"—Tyndall) that it could be produced under the guidance of such natural law, hence, it is clearly seen that it belongs to *another order* of reality altogether—a somewhat which though it may "follow upon" or "succeed to" a certain series of phenomena, is not of that series (*i. e.* not a term of that series)—but a thing apart, its *limit.* It is not a product of the development or "evolution" in question—but a consequence of the "interruption" of that law by a power or agency *ab extra* —*i. e.* external to the energy operating within the development. It occurs, in short, *post hoc, sed non propter hoc.* From whatever point of view we contemplate the matter, then,—whether physiological or psychological, the same conclusion is inevitably forced upon us. With the appearance of life we are face to face with a break in the orderly process of inorganic evolution. Living protoplasm is not the product of the inorganic development leading up to it (not a natural consequence of the interaction of its constituent physico-chemical forces)—although the highest stages of such inorganic Evolution constantly suggest and even imitate this its "*limit,*" even as the many-sided, inscribed polygon increasingly imitates and suggests its limit, the circle, the farther its development is continued. Like the limit of every development, it is a thing apart—*a new creation.*

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*Id. p. 421.

§*Prim. Factors Org. Evolution*, p. 504.

Before concluding this portion of the argument however, the writer desires to warn his readers of a certain contingency which, if it should arise, might seemingly contradict the confident statements above. Thus, we are not unmindful of the possibility of an announcement at any time from the popular press to the effect that this "impossible dream" has been realized and living matter actually manufactured in the laboratory. For it is by no means beyond the realm of the conceivable (however improbable such an event may appear at present) that man—himself a living being, may—by some process as yet unknown and unforeseen to us—artificially infuse his own, or other, life into some complex of non-living elements in such manner as to effect the miracle. But this "artificial" production of living matter would be, if accomplished, not a disproof but a *confirmation* of all that the writer is here contending for, despite the fact that it would, as certainly again, be interpreted by the uninitiated—or at least those unacquainted with the details of the problem—as a complete refutation of the position here assumed. Immediately upon the consummation of such a result, such startling head-lines as the following would doubtless appear in all the newspapers:—"LIFE ARTIFICIALLY PRODUCED IN THE LABORATORY"; *"The Dream of Science at last Realized by Success of Wonderful Experiment"; "Abiogenesis completely vindicated"; "The Doctrines of Theology and other Myths of Religion conclusively Shattered"; etc.* Be it understood once and for all, therefore, that what we are here affirming is not the impossibility of living matter ever being "artificially" produced in the laboratory, but only the impossibility of its being so "artificially" produced out of the forces and elements of non-living matter *alone, and uninfluenced by any already existent life-energy in the environment.* We not only do not deny but, on the contrary, we emphatically affirm that life can and does raise non-living matter to its own level. The plant is doing this very thing daily before our eyes; and who knows but what man—himself a *living agent* no less than the plant—may successfully imitate the latter by devising some process through which his own life-energy, or that of some animal or plant, or even life-energy derived from some other source, may be caused artificially to influence non-living matter in a similar way. As a matter of fact, in the process of food assimilation, man and animal, no less than plant, are daily producing new living material (protoplasm) out of non-living food energies. But it is the already existent life-agent in plants, animals, and men that does this. The dead organism can never accomplish the feat.

Moreover, we say that "even life-energy derived from some other source" may be utilized in this way, for it must be remembered that there is always the possibility that life may yet be discovered already existent in some forms of matter other than protoplasm—the so-called "physical basis of life." If this should be well founded—(and it has long been advocated by eminent authority)—the introduction of such a factor into a complex of non-living chemicals might result in the artificial formation of living protoplasm, thus giving further color to the deception. Reference is here made to the speculations of Fechner, Preyer, Pfluger, J. Butler Burke, *et al.* Though in many particulars these writers differ widely, they all agree in assuming that life is a primal form of energy, having its own characteristic mode of activity (a form of "polarisis"—Burke) and that, consequently, wherever such a mode of activity be found—whether in protoplasm or in an incandescent nebula—there is life. In one way or another, they all assume that life existed *before protoplasm.* That although it is in protoplasm that we see it manifest in its highest form, that it is nevertheless independent of that form. It pre-exists as a definite "energy-system" even in the lowest aggregations of matter, even preserving its individuality in the incandescent nebula, since fire itself is (according to some) a form of its manifestation. Now there is much to commend in these hypotheses, for whether or not any one of them can be substantiated as such, they nevertheless agree in recognizing the all-important fact that life is a *primal* form of energy—coincident with the dawn of the cosmos—a proposition which we would be the very last to dispute. While subscribing to no one of these hypotheses, therefore, we nevertheless agree with the general assumption underlying all of them —*viz*: that life is independent of protoplasm—that it existed prior to the formation of this, its so-called "physical basis"—and must be regarded as a primary form of cosmic energy. We venture to affirm, therefore, that when the announcement comes that living protoplasm has been artificially produced in the laboratory, and when once the intense excitement has subsided sufficiently to permit a careful and unprejudiced examination of the matter, it will be discovered that, though artificially produced, it has not been produced as the simple "resultant" of a combination of non-living energies, but that a further factor, x, not contained in any of the physical or chemical forces entering into the synthesis, has been (consciously or unconsciously on the part of the experimenters) introduced into the combination. Nor is this the only contingency that might arise. It is by no means inconceivable that we may yet, even in the ordinary processes of Nature, be confronted somewhere with the sudden "emergence" or life, and that, too, to all appearance, out of the very substance of non-living matter; and still the conclusion that it had been "derived" from such matter would by no means necessarily follow. It would only prove to be another case of "*post hoc, sed non propter hoc.*" Mere sequence, in other words, does not spell causality. This has ever been one of the cardinal fallacies with Evolutionists. For example, the possible discovery that certain chemical elements under the influence of electricity, or some form of radiation, might actually manifest vital phenomena, would no more prove that the life so manifested was the *product* of these conditions than does the corresponding fact that rain, cloud, and thunder, are attended (under certain conditions) with electrical discharges, prove that this last phenomenon is the product of the foregoing. In either case, we are putting the cart before the horse. In short, we not only agree with Helmholtz in asserting that "we are justified, perhaps, in seriously questioning whether after all life has ever arisen, whether it may not be even as old as matter", but we go farther than Helmholtz in affirming that it is older than matter —that matter itself is but a by-product of life; while life, in turn, is but an embryonic manifestation of mind;—mental activity in its lowest terms.

This blunt expression of our firm belief in Idealism as the only key to the ultimate solution of the Riddle of the Universe, will, of course, be exceedingly distasteful to the average biologist, but that it is a conclusion which can no longer be successfully repudiated in scientific circles, must now be obvious to every one who is acquainted with the latest results of physico-mathematical research. The idealistic conclusions to which Jeans, Eddington, and other authorities in this department, have been recently driven, seem revolutionary in the extreme to those devotees of the purely physical sciences, who have never looked beyond the horizon of their own special spheres of research, and whose appreciation of the methods of philosophical argument has ever been superficial. But we shall have occasion to discuss these matters later on. For the present it suffices to say that inasmuch as we regard life as even *older* than matter itself, we not only hold with Pfluger that "the chief conditions of its appearance are associated with a time when the earth was a glowing ball of fire," but that this very condition of incandescence was itself the product of the primal life-activity. That behind the veil of nebulae—yes, behind the veil of electricity (matter) and radiation,—in that fundamental polarisis of energy which constitutes the very genesis of the universe, we must look to discover that primal life, or living mind, which later becomes progressively "embodied" in the course of cosmic development. From this point of view, it will be readily seen that there is all the difference in the world between life becoming progressively "embodied" in matter, and so "emerging" out of matter at some definite stage in its development, and the conception of its being "derived" from, or "evolved" out of matter. The first conception is the one which we here defend—the second we deny.*

But let us now return from this necessary digression. Clear as is the evidence of the great "break" which exists between the non-living and the living, and futile as have been the attempts of science to bridge the chasm, either by experiment or by logical argument, yet because of the persistency with which so many Evolutionists continue to cling to this dream of abiogenesis (the only hope of those who deny a primordial act of creation), we propose to examine this matter in still greater detail.

"Until about forty years ago," remarked Prof. LeConte in a most delightful work on the relations of Evolution and religion,* "the different forces of Nature, such as gravity, electricity, magnetism, light, heat, chemical affinity, *etc.,* were supposed to be entirely distinct. The realm of Nature was divided up into a number of distinct and independent principalities, each subject to its own sovereign force and ruled by its own petty laws. About that time it began to be evident, and is now universally acknowledged, that all these forces are but different *forms* of one, universal, omnipresent energy, and are transmutable into one another back and forth without loss. This is the doctrine of correlation of forces and conservation of energy, one of the grandest ideas of modern times. But *one* force seemed still to be an exception. Life-force was still believed to be a peculiar, mysterious principle or entity, standing above other forces and subordinating them; not correlated with, not transmutable unto, nor derivable from, other and lower forces, and therefore in some sense supernatural. Now, if this be true of living *forces,* it is perfectly natural, yea, almost necessary, to believe that living *forms* are wholly different from other forms in their origin. New forms of dead matter may be derived, but new living forms are underived. Other new forms come by natural process, new organic forms by supernatural process. The conclusion was almost unavoidable. But soon vital force also yielded to the general law of correlation of natural forces. *Vital forces are also transmutable into and derivable from physical and chemical forces. Sun-force falling on the green leaves of plants, is absorbed and converted into vital force, disappears as light to reappear as life. The amount of life-force generated is measured by the amount of light extinguished. The same is true of animal life.* As in the steam-engine the locomotive energy is derived from the fuel consumed and measured by its amount, so in the animal body, the animal heat and animal force are derived from and measured by the food and tissue consumed by combustion. *Thus, vital force may be regarded as so much force withdrawn from the general fund of chemical and physical forces, to be again refunded without loss at death."* Now it is not often that we find ourselves in disagreement with Prof. LeConte, nor would we personally pre-

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*As already stated, our position is that of the thorough going Idealist. We believe that life and mind are behind the entire universe of matter —that, in fact, space-time, gravitation, electricity, (matter), radiation, are all expressions or objectifications of living mind, and that in the course of Cosmic development the Eternal Mind progressively "embodies" itself in the organic forms of plant, animal and man.

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*"*Evolution and Its Relation to Religious Thought,*" p. 35 *et seq.*

sume to take issue with him on such a subject, were it not that he himself has, elsewhere in his writings, so qualified and even contradicted this statement as to render his real meaning obscure, to say nothing of the further fact that later investigation has proved that the ordinary interpretation placed upon it (*viz*: that life is to be identified with a certain combination of chemical and physical forces) is altogether erroneous. Indeed, this statement has been hailed with delight by a certain class of rationalists who, as a consequence, loudly proclaim the fiction as one of the established results of the principle of the conservation of energy.

It was just such a statement made by Joseph McCabe, when replying to Sir Oliver Lodge's criticism of Haeckel, which brought forth, in turn, the withering rejoinder of the great physicist. McCabe had written,—"There is no serious scientific demur to Haeckel's assumption of a monism of the physical world, and his identification of vital force with ordinary physical and chemical forces . . . . . On all sides we hear the echo of Professor LeConte's words: 'Vital force may now be regarded as so much force withdrawn from the general fund of chemical and physical forces.' " Here, then, was a clear cut and confident avowal of this wide-spread impression, to which Sir Oliver Lodge replies in no uncertain language:—"Very well then, here is no conflict on a matter of opinion or philosophic speculation, *but divergence on a downright question of scientific fact* (let it be noted that I do not wish to hold Professor Haeckel responsible for these utterances of his disciple: he must surely know better), and I wish to oppose the fallacy in the strongest terms. If it were true that vital energy turned into or was anyhow convertible into inorganic energy, if it were true that a dead body had more inorganic energy than a live one, if it were true that these 'inorganic energies' always or ever 'reappear on the dissolution of life,' then undoubtedly *cadit quaestio;* life would immediately be proved to be a form of energy, and would enter into the scheme of physics. *But inasmuch as all this is untrue—the direct contrary of the truth —I maintain that life is not a form of energy, that it is not included in our present physical categories, that its explanation* *is still to seek.* And I have further stated—though there I do not dogmatize—that it appears to me to belong to *a separate order of existence,* which interacts with this material frame of things, and, while there, exerts guidance and control on the energy which already here exists; for, though they alter the quantity of energy no whit, and though they merely utilize available energy like any other machine, live things are able to direct inorganic terrestrial energy along new and special paths, so as to achieve results which without such living agency could not have occurred—*e. g.* forests, ant-hills, birds' nests, Forth bridge, sonatas, cathedrals."*

Now there can be no question as to the correctness of Lodge's position on this point, and it is significant that in his later work, (*Haeckel's Critics Answered*), McCabe is altogether silent on the matter, and contents himself merely with questioning the further opinion of Lodge as to what, in all probability, is the real nature of the life principle. This, however, is another proposition altogether, and whether or not Lodge's particular conception of the matter can be logically defended (and be it remembered that he tells us distinctly—"there I do not dogmatize"), it has nothing to do with the issue under discussion. What Lodge was disputing, and what we here are also disputing, is the confident assertion which we hear so often repeated, in pseudo-scientific literature, that science has proved that what we call life is nothing more than a resultant of physical and chemical forces;—that "there is no serious scientific demur to (the) . . . identification of vital force with ordinary physical and chemical forces" (McCabe, *supra*),—that "Vital force may now be regarded as so much force withdrawn from the general fund of chemical and physical forces," (LeConte). This statement is simply *untrue;* as Sir Oliver Lodge says, it is "*The direct contrary of the truth.*"

For sixty years and more the attempt has been made to prove this very point without a particle of success, and for several decades past the reaction against such mechanistic interpretations has been steadily increasing. As McCabe himself admits —"Professor Lionel Beale and Dr. Mivart are well-known ad-

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**Life and Matter,* pp. 131, 133.

vocates of 'Vitality' in this country; several French biologists still speak of the vague *idee directrice* which Pasteur imagined to control the growth of the organism; in America, Cope and Asa Gray advocate a form of Vitalism; in Germany it is urged by Nägeli, Bunge, Rindfleisch, Dreisch, and Benedikt, in Italy (more or less) by Gallardi, in Denmark by the botanist Reinke. The ideas of these writers differ considerably, but they agree in holding that some directive or 'dominant' principle must be *superadded* to the physical and chemical forces of the organism."* This list might now** be considerably extended. The main point that we desire to emphasize, however, is not the actual number of these men, or even the validity of any one of the explanations offered, but the fact that one and all of them have been driven to adopt some theory of "a principle *superadded* to the physical and chemical forces of the organism" because *of the absolute failure of science to prove the favourite assumption of materialists that "vital force may now be regarded as so much force withdrawn from the general fund of chemical forces"—its failure to prove the "identification of vital force with ordinary physical and chemical forces."* If science had ever proved this point there would be no "vitalists" of any description amongst scientists today. What then are the facts? They are easy to discover for any one who has the desire to see them. Science has apparently proved that all the activities of the living organism are accomplished *through the instrumentality* of physical and chemical forces, and that precisely the same amount of energy which it thus assimilates from the physical world, and employs to carry out its own unique designs, is subsequently returned to nature. In short, science has by no means disproved the existence of a life-principle. She has merely proved that the source of the energies manifested in the various activities of the living organism is not to be attributed—as so many have thought—to the life-principle itself; but to the physical and chemical forces which it assimilates from Nature and uses for its own specific ends: in precisely the same way that the source of the energy

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**Haeckel's Critics Answered*, p. 110.
** (Since the above was written.)

utilized in running a steamship from New York to Liverpool, is not to be attributed to the living navigator, who predetermines the course, and guides and directs the vessel to its destined port, but to the coal, oil, or other material used as fuel in the engines. To prove that the actual mechanical energy expended on such a voyage is derived from, and is equivalent in amount to, the energy stored up in the fuel, and is not derived from the man at the wheel, has no bearing whatever upon the existence of the latter—in no way justifies the assumption that he does not exist, or that he is not the most important factor in the whole voyage. Not only do we know that the navigator exists and utilizes the forces of external objects to accomplish his purpose, but to try and explain the numberless trips of such a vessel from New York to Liverpool and return, in terms of the energies supplied by the fuel in the engines *alone,* would be the acme of absurdity. Yet it is precisely this absurdity we are guilty of when we undertake to account for the phenomena of life in terms of the physical and chemical energies which every organism necessarily employs to acomplish its development. Transformed physical and chemical energy can no more explain the complicated but ever definite, and orderly sequence of events which go to make up the ontogeny of a living organism, than they can explain the similar, though far less, complicated, yet ever definite and orderly sequence of events that go to make up a voyage to Liverpool and return. In each case, *a further factor* must necessarily be assumed, if the enigma is logically to be explained.

So much for a general statement of the case. Let us now examine the matter somewhat more closely. The real result of scientific investigation may be briefly summed up as follows. The formation both of organic and living matter (protoplasm) is a process going on before our eyes every day, whenever sunlight, water (H_2O), carbon dioxide, (CO_2), and ammonia (NH_3) are brought together in the presence of *already existent* living matter (protoplasm). This last condition, which we have italicized, is especially to be noted as it is the key to the whole problem. Yet it is precisely this condition, which, though never denied by writers of any school, is nonetheless persistently made light of, by those who desire to see the entire mystery of life explained in terms of physical and chemical forces alone, (here the physical force of light, and the chemical forces involved in the H_2O, CO_2, and NH_3). Now the position of Professor LeConte on this particular matter is disappointing, for while both in his well known essay (*Correlation of Vital with Chemical and Physical Forces*"*) as well as in his further references to the subject in his great work, *Evolution and Its Relation to Religious Thought* he acknowledges the existence of this condition, he nevertheless belittles its importance, intimating that though invariably present to-day, it is not necessary to assume that it was present at the first origin of life on earth.[§] It is on the basis of this assumption (which is, of course, a begging of the whole question) that he justifies his omission of this factor altogether, from time to time, in the discussion, using language such as that quoted above. Moreover, in his essay, the ambiguity of his real position becomes more and more pronounced as he proceeds, until—after all these vain attempts to ignore the unwelcome factor in order that he may prove vital force to be nothing more than transformed physical and chemical forces—he finally (in the face of all that he has said) comes out with the remarkable confession that, after all, this "very peculiar condition" can not be overlooked—that "there is something so wonderful in this peculiarity of vital force that I must dwell on it a little" and, finally, at the end of the entire essay, when he has apparently proved to his own satisfaction that there is no essential difference between vital force and the physical and chemical forces round about it—that, in fact, it "may be regarded as so much force drawn from the common fund of physical and chemical forces, to be again all refunded by death and decomposition," yet, he continues, it must still be confessed—when we come to consider "the difference between the living and the dead organism", that, after all, "*the difference is immense, is inconceivably great.* What is the nature of this difference expressed in the formula of material

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*The first essay published by Prof. Le Conte appeared in the *American Journal of Science*, November, 1859. The present Essay, from which we quote, will be found in Balfour Stewart's work on the *Conservation of Energy* (1874).

[§] See *Evolution and Religious Thought*, p. 317, Note.

science? What is it that has gone, and whither is it gone? *There is something here which science cannot yet understand. Yet it is just this loss which takes place in death, and before decomposition, which is in the highest sense vital force.*" Now it is very obvious from these, and other passages which might be adduced, that LeConte was never quite satisfied with his own explanation of the enigma, despite the unquestioned value of his contribution to the subject.

If, however, he had only examined a little more carefully this last admission respecting the "inconceivably great" difference between "the living" and "the dead organism," he would have seen for himself the fallacy of his former statement that "Vital energy may now be regarded as so much force withdrawn from the actual fund of chemical and physical forces." This fallacy, which is commonly repeated by writers like McCabe, is easily detected. Because it has been apparently proved that the amount of physical energy returned to nature upon the death of an organism is the exact equivalent of the amount originally assimilated by the living organism from nature,* it is thereby argued that the so-called "vital force" is nothing but a particular synthesis (a "photo-synthesis") of so much physical and chemical energy which, when the synthesis is dissolved or disintegrated (as at death) is returned again to nature absolutely unchanged in quantity. Now, if it had ever been proved, in the first place, that so much chemical and physical energy alone combines, through photo-synthesis, to form living matter; and that with the dissolution of this synthesis of living matter (at death) precisely the same amount of chemical and physical energy is liberated, the argument would be unimpeachable. But this is precisely what has *never* been shown. In no instance has it ever been shown that physical and chemical forces were the *only* factors entering into the synthesis, but, on the contrary,

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*We say "apparently", for while we have no object whatever in denying the alleged fact—which is in line with the theory of the conservation of energy—yet we are by no means certain that it has ever been experimentally *demonstrated.* An absolutely decisive experimental test of the matter is one that is very difficult to carry out. As a matter of fact, too, this alleged demonstration of the theory has been emphatically denied of recent years.

in every case it has been demonstrated that an additional factor —*viz*: *pre-existent life itself*,—is necessary to effect the combination. Now, obviously, if this factor is always necessary to effect the synthesis, then when the synthesis is dissolved, as it is at death, this "death" or "dissolution" simply signifies the liberation of the "synthesizing" factor—*i. e.*, *life* and consequently, what is left in the now non-living matter is nothing but the remaining factors in the synthesis—*viz*: the same physical and chemical energies assimilated, or their equivalents. To the unprejudiced inquirer, there is really no other rational explanation of the phenomena; and, indeed, no other is demanded save by those who have an already pre-conceived theory to defend.

But to return once more to our examination of the details of the problem. We find living matter, through the instrumentality of solar light and heat disrupting the inorganic compounds CO_2, H_2O, and NH_3,—rejecting the excess of O, or O and H, and combining the remaining elements to form organic compounds. "To form the amyloids—starch, dextrine, sugar, cellulose—only CO_2, and H_2O are decomposed, and excess of O rejected. To form albuminoids, or protoplasm, CO_2, H_2O, and NH_3, are decomposed, and excess of O and H rejected." So much for this first stage of the process. Once organic compounds, such as starch, sugar, gum, chlorophyl, oil, albumen, etc., have been formed under the instrumentality of solar light and heat, a new stage begins. Of the organic compounds thus elaborated, only a very small portion is transformed directly into new living material (protoplasm); a second part is allowed to decompose, and the energy set free in this breaking down of the organic material is utilized by the life-principle in the differentiation of tissue; while a third, and by far the largest portion, is stored up for future use. All these changes and transformations, be it noted, are carried out *under the guidance and direction of the living principle.* While, in other words, the materials furnished are the chemical elements C, H, O, N, and the energies employed to effect their transformations are solar light and heat, yet it is a third principle that guides and directs the combination of these forces to the one certain result. Carbon, oxygen, hydrogen, nitrogen, heat, light, if thrown together, will no more of themselves combine to form a living organism, than will butter, sugar, eggs, flour, milk, soda, currants, raisins, *etc.*, spontaneously combine to form a fruit-cake. *The guidance and direction of a life-principle is an absolutely essential condition to the attainment of either result.* Moreover, the possibility of accounting for these very first stages in the formation and elaboration of living matter without the assumption of pre-existent life of some kind, becomes the more hopeless when we endeavor to explain the further complicated series of phenomena which ensues in the "development" of the germ, to maturity, and the marvellous capacity displayed by the organism in adapting itself to the ever shifting conditions of its subsequent environment. Only the assumption of such a life-principle can account for the mystery, and as the presence of living matter is, as we have seen, a never failing prerequisite or condition in the only actual experience we have of the origination of new living material, this assumption of such a unique principle becomes *an unavoidable logical necessity.* Whether or not, this peculiar "directive agency" is to be characterized as a specific "force" or differentiation of "energy" in the technical sense in which these terms are used in physics (a matter which will presently be considered), it is useless to deny its existence, or to attempt to account for all the unique phenomena attributed to it in terms of mere chemical and physical forces. Many authorities who clearly recognize the existence of such a "directive agency" refuse, for one reason or another, to designate it either "force" or "energy". As long ago as 1868, we find the distinguished physiologist Dr. William B. Carpenter maintaining this view. "When we look carefully into the question," says he, "we find that what the germ really supplies *is not force, but the directive agency;* thus rather resembling the control exercised by the superintendent builder, who is charged with working out the design of the architect, than the bodily force of the workmen who labour under his guidance in the construction of the fabric."* Solar light and heat, he argues, "supply

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*See Youmans' "*Correlation and Conservation of Forces*", p. 412. *On the Correlation of the Physical and Vital Forces.*

to each germ the whole power by which it builds itself up, at the expense of the materials it draws from the inorganic universe, into the complete organism; while *the mode* in which that power is exerted (generally as vital force, specially as the determining cause of the form peculiar to each type) depends upon the *germinal capacity* or directive agency inherent in each particular germ."*

Now this is substantially the position assumed by Sir Oliver Lodge and many other authorities to-day. The progress of science since the days of these early contributors to the subject, has added nothing essentially new. We have had more refined discussions of the subject, more exhaustive examinations of its various details, far more exact and elaborate methods of experimentation have been invented, and the entire problem attacked from many other angles than that from which it was originally approached, but there has been no substantial change in the situation. Chemistry has indeed amazed us with its achievements in the artificial synthesis of organic compounds: Butschli, Quincke, Loeb, and others, have astonished us with the results of their experiments in the manufacture of so-called "artificial protoplasm"; the discovery that the cyanogen radical (CN) can arise in nature under conditions of great heat, has been emphasized by Pflueger, Haeckel, and others, as affording a possible clue to the manner in which life might possibly have originated in the geological past: while more recently the success of Professor Baly in artificially imitating the photosynthesis that occurs in the green leaves of the plants, and thereby producing formaldehyde (CH_2O), and even in effecting the synthesis of "nitrogenous carbon-compounds from carbon dioxide, and water and nitrites" has rightly elicited the unstinted applause of the scientific world, but with all these advances there has been no hint of the manufacture of *living* matter, nor have any of these discoveries afforded even the most remote theoretical explanation of life in terms of physical and chemical forces. As Prof. J. Arthur Thomson has well said, "no complete vital phenomenon has been as yet described in terms of matter and motion. A new synthesis has emerged, that has made everything new. *The physico-chemical formulae do not suffice for the adequate description of vital activities. There is a chemistry and a physics of the living body, but when they are added together they do not amount to a biology; and they necessarily fail to grip mind.*"[*] Elsewhere he says, "no complete vital phenomenon, not even the contraction of a muscle has yet received adequate description in terms of chemistry and physics. It is necessary to use special biological categories, such as the organism's power of enregistering its experience within itself so that it influences subsequent behaviour. Similarly, with growing, reproducing, developing, varying, and other vital qualities, they appear to us to be ultra-mechanical. In short, organism is more than mechanism; compared with the not-living, *it is a new synthesis.*"[‡]

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*Id. p. 420.

It remains a fact, therefore, that the assumption of a life-principle of some kind is absolutely necessary to explain both the formation of living matter, as well as the unique activities it exhibits. In short, though it still remains apparently true that the same amount of energy "drawn from the common fund of physical and chemical forces" is "again all refunded by death and decomposition," even as LeConte asserted, it nevertheless remains a fact also that neither observation, experiment, nor hypothesis has ever been able to explain the *formation* of living matter out of these forces, or the peculiar *activities* of the living matter so formed, apart from the assumption of a *tertium quid.* And it is this inexpugnable fact that shatters the whole materialistic argument, so loudly and confidently proclaimed by numbers of rationalists like Joseph McCabe (and even by some professional scientists who should know better) that science has now demonstrated the "identification of vital force with ordinary physical and chemical forces," and has thereby proved the unbroken continuity of the evolution process from the non-living to the living without the aid of any agency *ab extra—i. e.,* any factor external to the natural forces (physical and chemical) operating within the development itself. *Science has proved nothing of the kind.* It is this very assumption so confidently made, and so often repeated, by a certain class of writers that Sir Oliver Lodge here calls down in no uncertain language.

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[*] *Science and Religion,* p. 147.

[‡] Id. p. 127.

How then are we to explain this mysterious principle, whose existence it is impossible to deny? Here, indeed, there is wide diversity of opinion. Sir Oliver Lodge thinks it is a mistake to speak of it as "energy," though exactly what he means by "a guiding principle" or "a controlling agency" which is not to be interpreted as an energy of some kind, is not very clear. However this may be, there can be no doubt that in insisting upon the fact that there is such "a guiding principle" in every living organism, which is not to be identified with any of the physical and chemical forces it utilizes or employs as power to build its "fleshly tabernacle" and carry out its own "designs" and "purposes," he is making a statement which cannot be successfully denied, and which in essence is all for which vitalists and the Christian world are contending. Says he, "I maintain that life is not a form of energy, that it is not included in our present physical categories, that its explanation is still to seek. And I have further stated—though there I do not dogmatize—that it appears to me to belong to *a separate order of existence,* which interacts with this material frame of things, and, while there, *exerts guidance and control* on the energy which already here exists; for though they alter the quantity of energy no whit, and though they merely utilize available energy like any other machine, live things are able to direct inorganic terrestrial energy along new and special paths, so as to achieve results which without such living agency could not have occurred—*e. g.* forests, ant-hills, birds' nests, Forth Bridge, sonatas, cathedrals. I have never taught, nor for a moment thought, that 'vital force is akin to physical force, but that it needs guidance'; the phrase sounds to me nonsense.* I perceive, not as a theory, but as a fact, that *life is itself a guiding principle, a controlling agency, i. e.*, that a live animal or plant can and does guide or influence the elements of inorganic nature. The fact of an organism possessing life enables it to build up material particles into many notable forms—oak, eagle, man,—which material aggregates last until they are abandoned by the guiding principle, when they more or less speedily fall into decay, or become resolved into their elements, until utilized by a fresh incarnation; and hence I say that *whatever life is or is not, it is certainly this: it is a guiding and controlling entity which interacts with our world according to laws so partially known that we have to say they are practically unknown, and therefore appear in some respects mysterious.*"* Now these last statements of Sir Oliver Lodge are unassailable. Whatever life is or is not, it is certainly a guiding, directing, controlling agency which assimilating physical and chemical energies from without, first combines them into new material, (protoplasm), which it then further elaborates, organizes, or systematizes according to a definite plan or pattern, and through the medium of this structural mechanism still further extends its operations into surrounding Nature, coordinating, arranging, and systematizing its various forces to effect certain definite ends or purposes. Indeed, the most striking characteristic of this new agency which (as the evidence already presented unmistakably shows) has here entered into combination with physical and chemical energies, is its *directing, controlling, organizing, and systematizing activity.* But what is organization, systematization, *etc.*, but *rationalization?* And what is an organizing or systematizing activity but a rationalizing activity or *mind*—Reason being simply the formula of mental activity ("the mind is a thing which reasons" —Wundt). To organize means simply to set in orderly relations, and an organizing agency is simply a "relating" agency and "relating" is reasoning, A "relating" activity, therefore, is a "rationalizing" activity—a rational agent or reason. "To relate," is "to reason"; or, as Dewey has expressed it, "reasoning is the act of relating."§ If, then, the essential characteristic of this new agency which has suddenly appeared in the midst of inorganic matter is admitted to be a relating, ordering, arranging, organizing activity, then its essential characteristic is

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*This in answer to McCabe's misinterpretation.

**Life and Matter,* pp. 133, 134.

§*Psychology,* p. 224.

"rationality"—life is incipient mind, and protoplasm—*i. e.* organized matter—is simply *rationalized* matter—matter in which reason has become incarnate. So obvious is this fact that it is difficult to understand how it should ever have been questioned. Indeed, we have only to compare the fundamental processes of living matter with the fundamental processes of psychical activity to perceive the analogy.

Thus, mental activity is a three-fold movement, presenting the following phases:—

(1) Integration (assimilation) of experiences in sensation.

(2) Differentiation (actualization) of such subjective experiences in objective form—perception.

(3) Organization or arranging (by attention) of these cognitive materials with respect to an ideal end or goal to be attained (self-realization).

Vital activity is also a three-fold movement, presenting phases precisely parallel to the above. Thus we find the life-process to consist of—

(1) Assimilation (integration) of energy *ab extra* (in food, *etc.*);

(2) Actualization (differentiation) of such transformed energy in new protoplasmic material.

(3) Organization or arrangement of the material so acquired with reference to a certain ideal plan or pattern—the specific "type" of the organism—the end or goal of its development.

Of course, when we thus identify life and mind, it must be understood that we are referring to mind in its incipient stage only—mere *feeling* (sentience) as opposed to *cognition.* Such a view was long ago set forth by Prof. E. D. Cope in his doctrine of *Archaesthetism,* and to those familiar with that theory, our meaning will be clear. "I think it possible to show," says he, "that the true definition of life is, energy directed by sensibility, or by a mechanism which has originated under the direction of sensibility." Moreover, he further continues, "If this be true, the two statements that life has preceded organism, and that consciousness has preceded organism are coequal expressions."* But as we shall have to deal with this subject again later on, we shall omit its further discussion here.

To sum up, then, all the evidence points to the conclusion that living matter (protoplasm) appeared for the first time here on earth as an "emergence"—*i. e.*, as a "new synthesis" or "creation"—wrought by an external agent acting upon antecedent inorganic matter, rather than as a simple evolution out of the potentials naturally resident in such matter. Applying the words of Prof. Patrick on "Emergent Evolution" to this particular instance of the phenomenon, we would say that "it seems more as if the new were *builded on* to the old, than as if the new were *growing out of* the old. If the new grows out of the old, as the word "Evolution" would strictly indicate, we should have to think of it as already potentially present in the old." But it is just this conception of the matter that is not sustained by the evidence, which ever points to the operation of some external, "transcendental" agent. To ask *where* this vital agent came from—*where* life was before it thus embodied or "incarnated" itself in protoplasmic material, presents no more difficulty than the similar question, which might be put to the physicist, as to where the electricity or magnetism comes from that is later embodied in particular physical objects. In our opinion life is primordial with the universe—it is behind and antecedent to the whole realm of physical phenomena, and it is only at particular points in space and time that it individuates inorganic matter—*i. e.* integrates or synthesizes such matter about a given centre—and so embodies or incarnates itself therein. This conception, therefore, of Life entering into inorganic matter *ab extra*—imparting its peculiar properties thereto—and so transmuting it into living protoplasm, is no more difficult to understand than is the analogous phenomenon of magnetic energy entering into a mass of unmagnetized iron, *ab extra*—imparting its peculiar properties thereto—and so

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*"*Primary Factors of Organic Evolution*", p. 513.

transforming it into magnetic material (a magnet). In short, life vitalizes non-living matter, just as electricity (or magnetism) magnetizes a bar of iron or a needle. But even this is not all. Not only does life infuse itself in non-living matter and, in the very act, transform such matter into living protoplasm, but it further proceeds to organize the protoplasm so formed, and to develop it according to its own definite structural plan. It is thus both the creator of protoplasm and the cause of its structural organization.

CHAPTER IX

The Emergence of Mind (Anima)

WE come now to speak of the next important "emergence" which confronts us in the history of organic development, *viz*: the emergence of what is commonly designated *mind*, but which, in our opinion, is more correctly described as *Sense-Perception.* In short, we come to speak of the emergence of that perceptual consciousness which presents itself co-incidently with the appearance of a centralized nervous system. As broadly speaking this so-called distinction between "life" and "mind"—between those organisms which are devoid of a nervous system, and those which possess such a system—corresponds in a general way to the grand distinction between the kingdom of plants and the kingdom of animals, it has also been customary, upon the part of many writers, to employ these latter terms when referring to the distinction between those organisms which possess mind and life, and those which possess life only. Neither from the psychological nor from the biological point of view, however, can such a usage be strictly justified, for, as is well known, there are many organisms devoid of a nervous system which are, nevertheless, classified as animals, and—as we shall presently point out—there is no reason to doubt but that mind, in the strict sense of the word, is present even in plants. At bottom, the question is one of definition—that is to say, of accurately defining just what is really meant by the terms "plant" and "animal", on the one hand; and just what is meant by the terms "life" and "mind" upon the other. Thus, we are told that "owing to the close relationship between the lower members of the animal and vegetable kingdoms, it is impossible to define *plant* in terms that will include all plants and exclude all animals."

For instance, if any one approaches the problem by fixing attention primarily upon the lowest unicellular organisms, it is difficult to discriminate between the truly vegetal and the truly animal. The Protozoa and the Protophyta shade so gradually one into the other that it is impossible to draw a definite line between them. The bacteria have never been satisfactorily classified. Though usually grouped with the plants, this arrangement has often been vigorously contested. Again, among the Coenobia, such forms as Volvox have been claimed both by zoologists and by botanists, while ascending into the realm of the diploblastic Metazoa, we find such highly differentiated forms as the Porifera, Actinozoa, and many Hydrozoa, so strikingly plant-like in character, that they have long been called *zoophyta—i. e.* "plant-animals". Indeed, the sponges, corals, and various Hydrozoa, were long believed to be marine plants, and to this day the uninitiated observer seldom knows the difference. On the other hand, no one can go beyond the limits of the coelenterates, and ascend into the sphere of the triploblastic Coelomata, without being aware that he has definitely entered the animal kingdom, and it is this fact, we say, that furnishes the key to the solution of the whole problem. Of course, we do not mean to say that even at this point the evidence of mind (*i. e.,* perceptual consciousness) is conspicuous, or that it ever becomes conspicuous until the centralized nervous apparatus here inaugurated only, has become a highly differentiated and specialized system. It is at this point, only the embryonic beginning or dawn of such perceptual experience, but, nevertheless, as this experience is indissolubly associated with specialized sense organs centralized in a supreme ganglion of some kind, it must be with the inauguration of such a system that we are to look for the *beginnings* of this higher experience which is so marked a characteristic of all the higher animals.

While, therefore, from one point of view—*viz*: that of the physiologist—there is good reason for placing such organisms as the sponges and coelenterates in the category of the animals (and we are very far from disputing the importance of this universally recognized distinction within its proper sphere), yet it is also true that from a purely psychological point of view, true animal life can only be said to begin with the appearance of those organisms which possess some kind of a centralized nervous system. Indeed, it is precisely such a nervous mechanism that the word "animal" implies, for it is only by the presence of this organ that we are assured that a true *anima, soul* (ψυχη) or psychical principle (mind) is incarnate within the organism. Wherever such a nervous mechanism is present, we have all the manifestations of true psychical activity; and wherever such a nervous mechanism is wanting we can discover no higher activities than the purely vital or vegetative activities characteristic of plant life.

Moreover, we have good reason for believing that both plants and zoophytes have sprung from a common stem. For whether or not we are ready to accept the view which Prof. E. D. Cope, of the University of Pennsylvania, defended with such signal ability, that *all* plants are but "the degenerate descendents of protozoan animal ancestors,"* yet the general opinion of Evolutionists has ever been that the true plants as well as these lower plant-like animals have had a common origin—the Protista of Haeckel.

When, however, we come to consider the relations of the zoophytes or acoelemata to the higher coelomata, we are confronted with a number of remarkable facts which make the supposition of the simple evolution of the latter out of the former, decidedly problematical. While the most conspicuous phenomenon connected with the transition is, as we have just said, the sudden "emergence" of psychical or perceptual consciousness, the physiological transformations which accompany this psychological emergence, are most extraordinary. Speaking generally, it is a change from the diploblastic to the triploblastic type of organisms, from the acoelomata to the coelomata, from radial to bilateral symmetry, from organisms devoid of a centralized neuro-muscular apparatus, vascular, excretory and respiratory systems, to organisms endowed with these, and other organs. Nor are these all. For even more remarkable,

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**Primary Factors of Organic Evolution*, p. 219 *et seq.*

in many respects, is the evidence here presented of a complete *revolution* which must have taken place in the reproductive processes—a revolution now abundantly attested by that singular, and but little understood phenomenon, commonly designated *alternate generation.* The vast significance of some of these changes—especially that of "alternate generation"—will be discussed later on. For the present, we merely call attention in a general way to the many evidences, physiological and psychological, of a tremendous transformation that evidently took place at this point in the progress of organic development, and its very obvious association with one of the most important "emergences" that has ever taken place in the course of cosmic development—*viz*:—the emergence of what is commonly called *mind.*

Returning, then, to the point immediately under consideration, we repeat that we shall look in vain for any fundamental mark of distinction between plant and animal until we happen upon the appearance of a nervous system organized about a definite centre of control, a phenomenon which does not present itself until we pass from the diploblastic acoelomata to the triploblastic coelomata—in short, until we enter the confused group of the so-called worm's (Vermes). But strange as this conclusion may appear at first sight, it is, after all, nothing more than what Linnaeus and Lamarck among naturalists, and Schopenhauer, Hegel, and other philosophical systematists have in one way or another, assumed to be true in making the distinction between "life" and "mind" coextensive with that between plant and animal or that between plants and the "sensitive animals" (Lamarck)—*i. e.* animals possessing some kind of nervous system. The so-called "animals" which are devoid of a nervous system, sessile, and vegetative in appearance and function (what Lamarck termed "*apathetic animals*"—*i. e.* animals without "feeling"), are not, from this point of view—true animals at all, but as their name implies, intermediate forms—"plant-animals" (zoophyta). Resorting once more to the principle of "the variable and its limit," we would explain the enigma by saying that the zoophytes represent that branch of vegetative organisms which have approached nearest the "limit" to which plant life was destined to "evolve," and, in consequence of the law that every variable when approaching its limit tends more and more to *simulate* and so *suggest* the same (the inscribed polygon becoming more and more "circular" or "circle-like" as it continues to approach its limit—the circle), they have come to be erroneously regarded as actually identical therewith. In short, just as a polygon of ten thousand sides might easily be mistaken by the eye for a genuine circle, so these highly developed vegetative organisms have come to be erroneously regarded as true animals. But just as we know that the polygon differs fundamentally from the circle, no matter how successfully it may imitate it, as it continues to develop, so we know that these "plant-animals"—with all their marked resemblance to true animals—are fundamentally distinct therefrom. Only with the "emergence" of what is commonly designated "mind," and which is acknowledged by most biologists to be coincident with the appearance of a centralized nervous system, is this limit actually attained.

This interpretation of the matter, too, has the advantage of being clearly in line with many other distinctions which are commonly cited as obtaining between plants and animals. Thus, it coincides with the distinction emphasized by Cope between the two very distinct modes of evolution—*physiogenesis* and *kinetogenesis* characteristic of these two groups. "In the animal kingdom, kinetogenesis, or the modifying influence of motion, is assumed to be the more potent and efficient cause of evolution; in the plant kingdom, physiogenesis." By "motion," Cope means "locomotion" effected through the instrumentality of a muscular apparatus controlled by a definitely formed nervous system, (neuro-muscular apparatus) and in further response to "molar", as distinguished from purely physico-chemical forces. As a rule, plants are stationary, or moved only by external influences, and where spontaneous mobility is in evidence, it is usually the result of plasmic strains, swelling of the cells, *etc.*—never of neuro-muscular activity. This distinction between organisms whose life is altogether concerned with "physico-chemical" reactions rather than with the kinetogenetic and molar factors, is exactly that which has recently been drawn by Korzybski* between plant and animal modes of existence. Plants, according to Korzybski, are "basic-energy-binders"; animals are "space-binders". That is to say, plants are mainly concerned with the building up of new organic compounds, *etc.*, out of the fundamental chemical elements and with the aid of physical energies; they are the "chemists" of nature, constantly analyzing and synthesizing, manufacturing protoplasm and organic compounds and if endowed with consciousness at all (which is usually denied them) are conscious of "sensations" only—*i. e.* the "thrills" accompanying the "shocks" and "stimulations" of these physico-chemical reactions. Animals, on the other hand, are distinguished from plants, in that they go beyond these physico-chemical experiences, and through the aid of a neuro-muscular apparatus, not only achieve the power of locomotion, but also, by means of special sense-organs, under control of a centralized nervous system, and in conjunction with such neuro-muscular apparatus, both receive impressions (sensations) from the external world, and "bind" or "combine" them into spatially-related "objects" of perception. It is for this reason, Korzybski calls them "space-binders." But, after all, these more elaborate and technical interpretations of the matter are nothing more than what the older physiologists long ago recognized. The "vegetative" as distinguished from the "animal" functions which were so commonly emphasized by writers like Dr. Carpenter half a century ago, were precisely the functions and activities here described, and it is to be noted that they have no significance except in so far as the presence or absence of a nervous system (strictly a neuro-muscular system) is tacitly assumed as the basis of discrimination. But, as we have said, this biological distinction between plants and animals carries with it the psychological distinction between organisms which are capable of perceiving spatial "objects" and "relations", ("Space-binders") and organisms which are wanting in such powers of perception; and it is further obvious that if this distinction is to hold good, we

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*"*The Manhood of Humanity,*" by Count Alfred Korzybski. See also further discussion of the subject in Prof. Cassius J. Keyser's—*Mathematical Philosophy.*

must include the zoophytes—which are devoid of a centralized nervous system[*]—in the category of plant, rather than of animal life.

But while in our opinion it is indeed true that the fundamental differentiation between plant and animal originates at this very point—*i. e.* where a centralized nervous system for the first time appears—and while, because of this, we think that one of the most satisfactory methods of distinguishing the two groups would be to designate the one as the *Aneurobia,* the other as the *Neurobia;*[§] and while again, we fully recognize the importance of what is meant when it is said that this distinction is synonymous with the distinction between "life" and "mind", yet we cannot, on the other hand, admit the correctness of this latter mode of expressing it, for we cannot admit that there is any "life" without "mind" or consciousness—however rudimentary the latter may be. In short, we here agree with Fechner, Nägeli, Haberlandt, R. France, Binet, et. al., in ascribing a genuine "psychic action" to plants and other Aneurobia (zoophytes, and unicellular organisms) and further agree with Wundt and Ziehen, in opposition to Romanes, Fritz Schultze, and Paulsen, that "*all psychic action is conscious*". Bergson also makes life and consciousness synonymous, and indeed there can be little doubt of the adage that "*to live is to feel.*" (Cabanis). The consciousness of an aneurobic organism, however, is a very different thing from the consciousness of a neurobic organism—so different, in fact, that the evolution of the latter out of the former is, in our opinion, simply inconceivable. They belong to two totally distinct cycles of mental evolution. The consciousness of the one is the consciousness of "feeling" (sensation) only; the consciousness distinctive of the other is a consciousness of perception. The confusion, in the case of most people, arises from confounding perception with consciousness *per se,* whereas perception is only a particular mode of conscious experience—a synthesis of certain sensations (feelings). Feeling or sensation *precedes* perception in the history of mental development, but it is no less a *conscious experience.* Indeed, the consciousness of a number of "feelings" or "sensations" must first be present before there can be any perception, for the act of perception is only the act of integrating an already existent group of feelings (sensations) into a single "unity-of-relatedness"—a rationalized-synthetic-whole or "object" of experience, and it is because the "percept" is such a new whole, unity, or "synthesis" (integration) of "feelings" (sensations) that perceptual consciousness constitutes a genuine "*emergence*". It is not the product of a further "evolution" or "differentiation" of sensations, but the product of an "involution" or "integration" or "synthesis" of these elementary conscious experiences. We are fully aware that there are some who maintain that there can be no consciousness of sensations *per se,* but only of perceptions; but this is altogether erroneous. The act of perception is simply the act of *interpreting* a number of already existent, conscious experiences (sensations), and we would never even attempt to "interpret" these sensations were we not first fully aware (*i. e.* conscious) of them.* It is this prior consciousness that calls forth the very attempt at interpretation; it is our very *awareness* of certain experiences—not understood or cognized—that impels us to endeavour to cognize or interpret them. *Perception is cognition,* though, in the case of the animal (sense-perception) cognition in its lowest terms—the interpretation of the simplest sensations only.

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[*] Though the beginnings of a nervous mechanism are to be seen in the coelenterates, it is merely incipient at this stage of organic development. A centralized system appears for the first time in Vermes. The fact however, that the undeveloped beginnings of a nervous system are to be found in some of the Coelenterata, taken in connection with the wide-spread phenomenon of "Alternate Generation" within the same group points unmistakably to the fact that the great transformation of which we are here speaking, evidently occurred in this transition from the diploblastic coelenterates to the triploblastic worms.

[§] Neurobia (fr. Greek—νευϱον, a nerve, and Βιος-life—organisms possessing nerves. Aneurobia (fr. Greek, α, without +νευϱον+Βιος) organisms without nerves.

To illustrate the distinction between sensation and perception, as well as to substantiate our statement as to our genuine "awareness" (consciousness) of the former before any attempt at perception is made, we call attention to one of the many

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*The mind cannot "interpret" anything which is not already a datum of experience—*i. e.,* a datum of consciousness.

familiar diagrams used by psychologists in explaining the matter. The eye is presented with a number of sense-impressions (sensations) which we may arrange at will so that we perceive either the top or the bottom of a stairway. That is to say, by grouping or synthesizing these sense-impressions in one way, we have the percept of a staircase upon which we are *looking down;* by rearranging or synthesizing them in another way we are presented with a very different percept—that of a staircase ascending *above our heads.* The perception—whichever it is——is a "creation" of our own,—*i. e.* an arbitrary synthesis (integration) which we make of a number of sense-impressions received by the eye. Have we any doubt that we really experience these impressions *before* we arrange them into percepts? Are you aware of nothing whatever until the percept bursts upon your view? Is it out of a group of "nothings"—*no conscious experiences whatever*—that you have formed this object? The question has only to be asked, in order to be answered. Not only are we conscious of these sensations *before* we "fuse" them into an object of perception, but once such a percept has been formed, we experience great difficulty in dissolving the "unity", and re-arranging these elementary data into a *new* synthesis. Nay, more! We actually battle with the inertia of these sensations before we succeed in doing so. We might produce any number of further illustrations of the principle. The confused, but intensely realistic, experience of a chaos of harsh, buzzing, jangling, and even luminous sensations, with which one is suddenly awakened out of a deep sleep, and which may continue some moments, before he is able to coordinate and interpret these meaningless and conflicting states of consciousness, in the definite, perceptual experience of a fire next door and the rush of the fire engines to the scene, is a good example of what is meant. It is erroneous therefore, to assert that we have no consciousness of sensations, *per se,* before we integrate them into percepts. Now, all that we are saying is that there are organisms in Nature that, like ourselves, are conscious of such elementary sense-impressions (sensations), but have no power to group them into perceptual experiences—organisms which *feel,* but cannot *perceive.* Plants, and the Aneurobia generally, belong to this category, and it is not till we come upon organisms endowed with a centralized nervous system, and specialized sense-organs, that we meet with beings which are capable of converting these initial experiences into definite objects of perception. In short, it is only the "space-binders"—organisms which because they are endowed with a higher capacity for integration, and the necessary nervous mechanism therefore, that can co-ordinate their many tactual, visual, and kinaesthetic "impressions" into spatially-related "wholes" or "objects" of conscious experience, which we designate "percepts."

Really to understand what this implies, however, we must reflect a little further upon the process of perception. "The percept is not a mere sum of sensations and memories", says Pillsbury; nor again, as Dewey remarks, is it to be regarded as "a passive operation of impressions, but (it) involves *the active integration* of various experiences.*" What is meant by these statements is simply this:—(1) No mere addition of sensations, or any mechanical mixture or combination thereof, can produce a percept; because a percept is no more the simple *sum* of the sensations entering into it, than is living protoplasm the simple "sum" of the non-living chemical elements which likewise enter into its constitution. Nor again (2) can any continuation of the mere "passive operation of impressions"—or any increase in the intensity or the diversity of the "impressions" themselves—in short, *any* continued evolution of the sensations *per se*, ever result in such an experience. For (3) the essential and significant feature of every act of perception is that it is the expression of an energy acting *upon*, and not *in*, the sensations involved—*i. e.*, an "out-going" and not an "in-coming" energy—an act of *attention* (*i. e.*, *ad-tendere to stretch out* or *to*), and not the consequence of an "impress" or "impression" of the "in-coming" energy kinetic in the sensations. In short, the percept is the product of an energy working upon and not within, the stream of "impressions" (sensations) received—integrating and co-ordinating them into rationalized, objective unities or "objects". That the percepts which are formed out of a group of sensations are the distinct "creations" of the "attention" of the organism, and not simply the inevitable effect of the sensations themselves impinging upon his consciousness, is easily demonstrated by the fact that out of precisely the same "impressions" received, we can form a number of different percepts "at will."*

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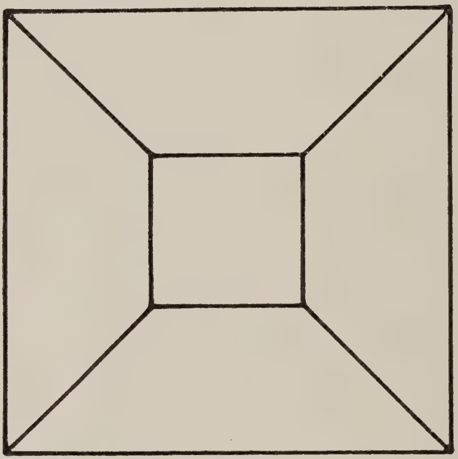
*Note the word.

We have often seen this illustrated in the diagram of the stairway, and we have a further, and perhaps still clearer, illustration of the principle in the following figure.



Out of the aggregate of "visual sensations" here presented, we may, at will, construct a number of different "objects" (percepts). We may so coordinate and interpret these sensations, for example, that we "see in them" (*i. e.* perceive) a room into which we are looking, the smaller square representing the wall at the further end. Again, we can interpret the same sensations to represent a truncated pyramid as seen in looking down from an airplane. Again, we may see in the figure nothing but a flat surface design for a rug or strip of matting. Still again we may see in it the back of an envelope with a small square of paper pasted over the middle; and so on. In short, *out of the same visual sensations* we may form *a succession of very diverse "percepts"*. The same principle explains why it is that different

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**i. e.* by effort of the will or attention.

people "see" different "objects" ("percepts") outlined in the same cloud, or, why it is that when two persons look out from the same window at night, one is absolutely certain that he beholds the phantom form of a long-lost friend in the garden beneath, while his companion sees nothing but a moonbeam gleaming through the shadows of the trees. The objects of perception are not, therefore, naturally and mechanically "evolved" out of the operation of the "impresses" themselves, but *are formed by the agency of our own attention operating upon these "impressions" of external energy.* Of course it is true that of all the arbitrary "percepts" which our wills may construct out of the sensuous material so furnished, only certain ones are found, in the course of time, to harmonize with the rest in such regular and invariable fashion as to form a logical and consistent whole of experience to which we give the name of "the order of Nature". It is probable, however, that children experiment with many perceptual images of their own arbitrary creation, before they learn which combinations really represent the order of Nature.* The important point with which we are here concerned, however, is the significant fact that the agent which perceives, whether in animal or man, is *not* to be identified with the energy immanent in the sensations which are felt—not the energy of the stream of "impressions" themselves (*i. e.* the impressing energies)—but an agent wholly distinct therefrom which attends to these "impresses"; an agent *without* or *transcendental to* the energies operating immanently in these "impresses," and which integrates and binds them together into various "unities" or "individuations" of its own creation. In a word, the percept is not *evolved* out of the impressing energies of the sensations which are felt, but is the product of an agent working upon these sensations from without. An agent *ab extra* (*i. e.* transcendental to the energies immanent in the evolving sensuous material) has infused itself therein, and combined these "impresses" into *a new synthesis* (possessing a specific "relatedness" all its own—*i. e.* a specific

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*Note that the percepts formed by attention (automatically) are the "objects of Nature" as we commonly understand that phrase—the order of the objective world; while the percepts constituted by the will (as distinct from the attention) form the world of Art, or creative impulse.

"logos"),—*a new creation.* Now, the name of this agent or integrating power is what psychologists speak of as the "attention", and is only another name for the *soul, anima,* or psychic principle of the animal. The soul is that energy which "attends to" the "impresses" (sensations) presented to consciousness, and binds them into the rational wholes or objective unities we call percepts. The soul is the attention—the agent which attends to or notices it's sensations. The plant *feels,* but does not *attend to,* "notice" or (what is the same thing) *know* its sensations. The animal, on the other hand, not only feels, but attends to its feelings, notices or cognizes them in perceptual experiences.

And here we come upon a further most important aspect of the matter which must now be emphasized. Just as this *anima* or psycho-dynamic agent of "the attention" manifests itself *subjectively* in the integration of sensations into percepts, so also does it, simultaneously, manifest itself *objectively* in the corresponding progressive construction of a centralized nervous apparatus or mechanism. We have every reason to believe that every activity of the mind is represented outwardly in some physical change or structural formation;—or in popular (though not strictly accurate) phraseology—every act of mind is *per se,* on the subjective side, a state of consciousness, and on the objective side, a physical phenomenon. Indeed, to speak of mind as "embodied" or "incarnated" at all (in any organism), is synonymous with affirming that the mental agent and its activities are manifest in physical form. Every embodied mind, therefore (whether sentient, percipient, or concipient) must, *ipso facto,* express its activity in some material form, and this "form", if the act be repeated often enough, becomes in the course of time, stabilized material or physical structure, while the subsequent activities of the energy coursing through these consciously constructed material channels becomes unconscious, automatic, reflex, and, ultimately, purely mechanical acts and movements. Protoplasm or organized matter is itself the expression or manifestation of sentient life (organization being synonymous with "rationalization"—*i. e.*, matter arranged by "ratio" or reason); while the further organization of this protoplasmic and sentient material into the specific mechanism of a centralized nervous system, and neuro-muscular apparatus, uniting and coordinating the entire mass, is itself again but the expression and manifestation of a yet higher psycho-dynamic energy—the percipient *anima* or "soul"—which has invaded this living matter from without, and "rationalized" or organized it into a yet more complex apparatus—an instrument suitable for carrying out the purposes of animal, as distinct from vegetal life.

In short, I am thoroughly in accord with the opinions of both Herbert Spencer and Prof. Cope that *life* and *mind* precede, and are themselves the *causes* of all material organization and bodily structure; so that in the most literal sense the physical system is the outward and visible expression or "product" of the activities of life and mind.*

Summing up the matter, then, we may say that the process by which sensations are continually being differentiated (evolved), no more leads to the formation of a percept, than the process by which clay is moulded and baked into bricks, leads (in and of itself) to the formation of a cathedral. The two processes—that of moulding and baking bricks, and that of arranging the bricks so produced into the form of a particular type of building, have nothing whatever in common. The second is *not* a natural and inevitable "evolution" out of the first. It is *not* a process logically implied by, and derived from the first, as a simple, and necessary consequence of the continued operation of that process in obedience to its "natural law" of progression. You might continue such a process (that of the moulding and baking of bricks) forever, but it would never, of itself, produce a cathedral, or any other specific pattern of building—but only a greater and greater number of bricks. It is only by discontinuation of the first process, and through inauguration of a new one—*different in kind* therefrom—that

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*H. Spencer—*Principles of Biology*, Vol. I. p. 153; p. 167. Cope's theory of *Archaesthetism;* see especially his *Primary Factors of Organic Evolution*, p. 508, 513.

this result can be attained. Now, in precisely the same way, no mere continuation of the process of sensuous experience can ever result in a perceptual experience. They belong to two altogether distinct spheres of mental activity.

But the discovery of this principle leads to yet further and most important consequences which must now be briefly considered. Not only is the transition from sentient to perceptual experience marked by a distinct "break" in the normal evolutionary process, but one of the most remarkable facts with which the psychologist is confronted, is that none of the three sharply distinguished departments of mental experience—sensation, perception, conception,—have any evolutional connection whatsoever, one with another. In a very real sense, perception may be said to be "built upon" sensation; and conception, in turn, "built upon" perception, but when we attempt to show how perceptions are evolved out of sensations (*i. e.*, produced *as a consequence* of the potentials *inherent* in the nature of the sensations which enter into the synthesis), or how conceptions, in turn, are evolved out of perceptions, we are immediately beset with difficulties insuperable. There is nothing in the nature of a group of sensations that can account for the rational unity or "synthesis" thereof which we call a percept, nor anything in the nature of a group of perceptions which can account for the yet higher rational unity or "synthesis" known as the class concept. Each of these "new syntheses" represents a "resultant. . .too large for the components." In neither case is the new unity or "emergence" the mere finite sum of the components, nor the character of the new synthesis to be identified with any mere mechanical re-arrangement of such components. In short, the percept is in no sense whatever a mere "mechanical mixture" of sensations, or the concept a like "mechanical mixture" of percepts. The "new syntheses" in question are never *mechanical combinations* of the components entering into them, but are the product of genuine *integrations* of these components —that is, mathematical integrations involving the reduction of these components to their limiting *zeros* (reduction of these actual energies to potential energies—potentials), and the simultaneous re-arrangement of these potentials into "new syntheses," whose consequent actualization or "emergence" present us with unities of a totally different order. Each of these "new syntheses," then, (percept and concept) is the product of a true mathematical integration, or, as the psychologist terms it, a *fusion of the potentials* of the antecedent mental experiences, and because such *integrations* are, self-evidently, the very reverse of *differentiations or evolutions*—involving the formation of new integrals rather than the "unfolding" (*i. e.* "evolution"), actualization or differentiation of the potentials inherent in an already existent integral; and because (in the very nature of things) no mere continuation of a process of pure differentiation can ever in any finite time, result in a process of integration or any process of continued unfolding (evolution) result in a process of enfolding (involution), it is perfectly clear that such integrations and their products, are not the result of Evolution at all, but of external agencies —*i. e.* agencies foreign to the evolutionary process, and operating in a manner directly opposite to that in which the inherent energies involved in the respective antecedent evolutions are seen to operate. Furthermore, because each and every such integration involves the reduction of actuality to potentiality, and the simultaneous eduction of actuality out of potentiality—in short, involves the problem of *the variable and its limit*—it is an exhibition of *infinite power*, and the consequent "interruption" of the normal evolutionary process by such an infinite power with the resultant "emergence" of a "new synthesis," spells *creation.*

But so important is it for us to have a clear understanding of this process of the transition from one order of unity (synthesis) to the next higher, which is here involved, that it will be advisable for us to take a concrete illustration. Let us examine carefully therefore the manner in which the mind rises from the given perceptual experience of some concrete object ("singular notion") to the experience of a class of objects—*i. e.* the conceptual experience of the "universal notion". The particular object is already given in experience as a "unity," but, it is to be noted, this unity is not simple, but complex—it is really a synthesis of many potentials which, when actualized, we speak of as so many diverse parts, marks, attributes, or "differentiations" of the object. Now, in the process of conception, here under consideration, the mind proceeds (1) to *analyze* or *differentiate* the object into its constituent qualities, marks, attributes—that is, to *evolve* the potentials latent in its integral—simultaneously comparing these with the qualities, attributes, *etc.*, of other objects round about, which it likewise analyzes, differentiates, and develops in like manner. Up to this point, be it observed, all is *evolution*—that is differentiation of the potentials latent in the different objects. But now comes a change—a radical change of procedure. From the many attributes thus differentiated or distinguished *inter se*, the mind next proceeds (2) to select (arbitrarily) one or more which are seen to be common to all the objects observed, as a *nucleus or centre of integration*, and when this point has been fixed upon, it then, in turn, (3) proceeds through *synthesis* or integration to "fuse" all the components concerned into a new whole, unity, or individual, characterized by a Logos or arrangement of the potentials involved, altogether distinct from that characteristic of the "Logos" of any of the objects concerned. Now not only should it be obvious that the *new unity* thus formed is the product of an integration or involution rather than a differentiation or evolution, but, it should further be evident that by no flight of the imagination can it possibly be accounted for as an evolution out of the original concrete notion, as it contains the potentials of a number of other objects (potentials not to be found in the integral of this concrete notion at all). Moreover, it also comprehends all these other objects as rational wholes or subordinate "units" within its integral. In short, it is an altogether new thing—*a new creation*—an entity altogether different *in kind* from the subordinate entities which it comprehends. The concept is no more a natural evolution, then, out of a number of percepts than is a house a natural evolution out of the stones and trees which enter into the composition of its foundations and walls. In each case, an energy not inherent in the components, but operating upon them from without, must necessarily be assumed to explain the enigma.

Now what is true of the concept is true also (as we have seen) of the percept. Both percepts and concepts are "emergences"—"new syntheses" of potentials, new integrals formed by creation. In each instance, the potentials inherent in a given number of "units" of one order, are (1) differentiated, actualized, or "evolved," and then these actualized differentiations, or specializations of Development (*i. e. Evolution*), are, in turn, (2) potentialized(reduced to *zero*) and these potentials integrated into a new synthesis, or unity of a higher order, having its own peculiar and distinctive Logos. This "new synthesis," thus created, becomes in its turn, an integral or germ which undergoes a development or evolution, through the unfolding or actualizations of its potentials in accordance with its characteristic Logos. Thus, even in mental development, there are alternate creations and evolutions. Indeed, every process of logical thinking presents us with such an alternation of integrations and differentiations, creations and evolutions.* The primary unit or "idea" is first analyzed, differentiated by the mind in order to bring out or actualize all that is latent in it—that is, to develop its potentials. This is *evolution.* We repeat the same differentiative or analytic process with a number of other given units or ideas. Then, after having developed these ideas, evolved or actualized their potentials, we begin to compare these differentiations or specializations one with another, and hitting upon some specialization common to all the ideas analyzed, we take this as a nucleus or centre, so to speak, about which a new synthesis may be formed, and then by the transcendental process of *integration* ("transcendental" because it involves a "leap" across the infinite gulf—from actuality through *zero* to actuality again—) *we create an altogether new synthesis, an unity of a totally different order from the component unities entering into it; viz: the new universal notion.*

We see, then, that it is supremely true that at this particular point in the process of organic development—the point commonly referred to as the transition stage from plant or vegetative life to animal or neuro-muscular life, but which is more satisfactorily described as the point of transition from the Aneurobia to the Neurobia—we are confronted with one of the most remarkable psychological "emergences" that is to be seen anywhere in geological history. It is not, however, the emergence of consciousness out of unconsciousness—as is often affirmed—but the emergence of perception out of sensation. The emergence of consciousness (feeling or sensation) out of unconsciousness was coincident with the emergence of life *per se*, out of the non-living. Here we are presented with the further emergence of percipience out of sentiency,—of cognition out of feeling, of "mind" in the common (but not strictly correct) acceptation of the term, out of "vitality."

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*Every judgment, every conception, every perception, indeed every act of consciousness is a polarisis of integration and differentiation—a unity in difference.

But the appearance of perception, indicating as it does a synthesis of former sensations, is not the only evidence of the *integration* that has here suddenly interrupted the otherwise orderly course of evolution (Differentiation). The corresponding biological and physiological phenomena which accompany the psychological "emergence" are also clearly indicative of the fact that a remarkable "individuation" of the multicellular vegetal mass has also occurred. To understand what is meant, we must here explain that the individuality of an organism is another subject which has ever presented a most difficult problem for the biologist to solve. That the single cells which lead an independent existence constitute the first, or lowest order, of individuals, is generally conceded. That there is again, above this lowest order of individuality, a higher order of so-called multicellular individuality is also admitted, but inasmuch as the unicellular individuals (both Protozoa and Protophyta) in the course of their further development associate themselves together in organized groups or communities of individuals (Coenobia) which lead by imperceptible degrees through all shades of multicellular organization from the lowest communal aggregations up to what are generally conceded to be truly individuated masses—true multicellular individuals (organisms)—it becomes a matter of great difficulty to draw the exact line of demarcation between the two;—*i. e.*—between what is a true multicellular individual and what is only a highly developed multicellular society. No one, for example, would be disposed to assert that such lowly groups as Volvox and Magosphaera are anything more than loose colonies of unicellular individuals, yet the moment we enter the domain of the multicellular plants and zoophytes, doubts begin to arise. With strange inconsistency, sponges have been treated both as multicellular individuals and as colonies of flagellated Protozoa. The corals also have been regarded as communities of distinct individuals; and many authorities have asserted that there is probably no real "individuality" to be found anywhere in the plant kingdom, but that every so-called metaphytan individual is but a highly organized society or "state" of protophytan individuals. The ease with which plants can be grown from "cuttings" of all kinds—the whole "individual" so-called, reproduced from even an infinitesimally small part has largely contributed to this view of the matter, and as the same principle applies to many coelenterates (*e. g.* Hydra,) and is observable also in many representatives of the group *Vermes,* and even amongst the star-fishes, it would appear that such an higher individuality is questionable even after we have passed the limits of the Aneurobia. However, it is only in a few, sporadic cases that the phenomenon can really be said to occur (if it occurs at all) beyond this point, for the fundamental "units" into which these higher cormi may be divided, and out of which, in turn, they may be reproduced, are not unicellular organisms, but multicellular units or zooids, each of which is furnished with its own centralized nervous system. In short, in the Aneurobia the colonies arise out of a single cell or a bud, whereas in the Neurobia the colony, or as it is now called, the cormus, arises out of a single zooid, and as the latter is an altogether different kind of physiological unit from either the ordinary bud or germinal cell, it is obvious that, with its appearance, we enter upon a new cycle of development.

But while this conclusion seems inevitable, and while it is necessary for us to recognize such units (the ancestral cells and zooids) as, in either case, the fundamental individuals, yet, inasmuch as the resulting compound masses which grow out of these, can be legitimately regarded as mere "extensions" of these primal individuals, it will be seen that there is much justification for the common opinion. Indeed, science has come very generally to recognize this fact, that "the resulting multitude of organisms may be regarded as in some sense *only an extension of the first individual.*" (LeConte). "Zoologically speaking," observes Prof. Nicholson, "an individual is defined as '*equal to the total result of the development of a single ovum.*' " Prof. John McCrady likewise remarks:—"Naturalists have found it necessary to modify altogether their ideas of individuality as their knowledge of Nature has increased. Indeed, we cannot at all understand what individuality in Nature is until we conceive the possibility of their being different orders and categories of individuals, and also admit that individuals may be individuals though organically connected together and literally partakers of a common life. Nay, more than this, we must admit that *individuality is by no means lost when it has been divided into many individuals; its own individuality is not lost, it has only become specialized into a more complex individuality.* When the polyp-embryo grows up into an arborescent group of individual polyps, it has passed out of the synthetic individuality of the embryo into the specialized individuality of the arborescent community, in which its parts have become specialized into a new order of individuals. Just as individuality is not destroyed by gemmation, but only converted into individuality of a different order, so also, by form changes the most extensive, individuality is not destroyed, but is only converted into a different order of individuality. For instance, I suppose that no one would deny that a caterpillar, the chrysalis, and the butterfly are but one individual, and that passing from the embryo-state into that of the worm, from the worm to that of the chrysalis, and from the chrysalis to that of the butterfly, not a fraction of individuality has been lost."*

From this point of view, then, which contemplates various orders of individuals—individuals of one order comprehending individuals of another and lower order—it would appear that the term is of relative significance only, and that a certain

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**Law of Development by Specialization*, p. 6.

aggregation of individuals which from one point of view may be regarded as a society only, from another point of view, may be looked upon as a true individual. For example, the specialized mass of subordinate individuals to which a single germinal cell (unicellular individual) has given rise, may—from one point of view, be regarded as the specialized body only of this ancestral head—a mere "extension of the first individual", and, therefore *per se* an individuality. From the standpoint, however, of that higher form of individuality toward which this arborescent mass of subordinate individuals constantly tends—*i. e.*, the individuality of the neuro-synthetic unity—the mass is not an individual but a community. In short, from the standpoint of that individual whose very definition is neuro-synthetic unity (*i. e.* unity realized through the instrumentality of a centralized nervous system), such a mass possesses no individuality at all—it is simply an un-individuated aggregate of separate individuals—a society. But however we may choose to look upon it, the point specially to be observed here is that from any view of the matter, we must face the fact that somewhere between the free life of the separate, independent unicellular organisms, and the organic life of numberless such organisms in the unity of a single multicellular individuality a *metamorphosis* has taken place—a complete metamorphosis, whereby a *community* has been converted into an *organism;* a *society* into an *individual.** It makes no particular difference however, so far as the matter now under consideration is concerned whether, as Haeckel assumes, this momentous event occurred when the Gastraeads or diploblastic organisms first appeared, or whether, as we believe, it took place with the appearance of the first triploblastic Trochozoon (Trochophore)—the essential fact to be noted is that it occurred, and science must explain it. How are we going to explain it *evolutionally?* With characteristic intrepidity, Prof. Haeckel boldly attempts to bridge the chasm by supposing that a multicellular individual is nothing more than a highly specialized unicellular colony. He supposes that the protozoan Coenobia through a long continued social development eventually attained a degree of organization so complete, that the independence of the constituent protozoan individuals was finally lost or absorbed in the higher individuality of the social whole or unity; that, in a word, these originally independent unicellular organisms, lost their independence and became mere constituent cells in the body of a multicellular individual. "For a long time," says he, "our planet was inhabited solely by such Protista or single-celled primitive creatures. From Coenobia or social unions of these afterwards arose the lowest histones, multicellular plants and animals."* Again, in further explanation of the process, he tells us—"The stable communities of cells which make up the body of the Histona, or multicellular plants and animals, are called tissues (*tela* or *hista*). They differ from the Coenobia of the Protista in that *the social cells give up their independence, assume different forms in the division of labor, and subordinate themselves to the higher unity of the organ.* However, it would be just as difficult to lay down a sharp limit between the Coenobia and the tissues as between the Protista and the Histona which possess them; the latter have been developed phylogenetically from the former. The original physiological independence of the cells which have combined to form tissues is more completely lost in proportion to the closeness of their combination, the complexity of their division of labor, and the differentiation and centralization of the tissue-organism. Hence the various kinds of tissue in the body of the Histona behave like the various classes and pro-

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*As, in our opinion, true multicellular individuality is effected in the many-celled society by an agent working upon the cells and tissues (cell-aggregates) of said society through the instrumentality of a centralized nervous system, it can, obviously, never be realized at any point in organic development below the appearance of such a nervous mechanism—which means at any point below the appearance of the true triploblastic Coelomata. Indeed, the mesoderm—out of which emerge all the connective tissues, structures and organs (muscular, circulatory, etc.) necessary to the extension of this nervous control throughout the mass, and to bring the differentiations of the ectoderm and endoderm into intimate union and communion—is itself "the outward and visible sign" that the true *integration* of the community has at last been realized—that what was formerly a multicellular society or, at best, a "state" of closely related members, has now become a genuine multicellular *individual* or *organism.* We may further add that many additional biological, particularly embryological, phenomena might be cited, further corroborating our conclusion that a true metamorphosis or *emergence* of primary importance has here occurred.

***Monism As Connecting Religion and Science,* p. 35.

fessions in a state. The higher the civilization and the more varied the classes of workers, the more they are dependent on each other, and the State is centralized."* Many other writers might be quoted to the same effect. Says Dr. Paul Topinard, "Individuals join together in aggregates, preserve their independence for a greater or less period of time, gradually adapt themselves to one another, *and end by becoming amalgamated in a single organism.* Where there were many individuals there is now but one; cohesion has now given rise to continuity among all the parts—that is to say, to a morphological unity."§

In other words—to state the whole matter boldly—Haeckel squarely assumes that a *society,* through sheer process of development—can (and in this instance) has become an *individual.* Now despite the apparent absurdity of such an idea, we wish to say right here that there is a great truth involved in this speculation—that, in fact, when rightly understood and interpreted, it really affords the true explanation of the matter; but, we must also add, that while Prof. Haeckel has, in our opinion, rightly anticipated the direction in which the secret of the riddle will be discovered, he has completely failed in his effort to unravel it, and is, indeed, utterly unconscious of the depth and significance of the problem. To state the situation briefly:—while it is true that multicellular individuality was the *end* toward which the protozoan Coenobium developed, it is *not* true (as Haeckel assumes) that this end was attained as the result of the normal evolution of the Coenobium—*i. e.* as a sheer consequence of the continued development of the community under the operation of its natural law of social evolution. Here, as elsewhere, we are face to face once more with the antinomy of the *variable and its limit.* That any process of mere social organization, however long continued, can, *per se,* convert a community into an individual, a society into an organism, is as unthinkable as the supposition that any continuation of the normal process of the development of the inscribed polygon can cause it

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***The Wonders of Life,* pp. 161, 162.

§*Science and Faith,* p. 91. See also the works of Spencer, Edmond Perier, Espinas, *et al.*

to become a circle. We freely grant however, that a highly developed society strongly suggests an individuality, and the more highly developed it be, the stronger is the suggestion. This is true also of the inscribed polygon, which becomes more and more suggestive of a circle—more and more "circular" or "circle-like"—as its natural development continues; but, as we all know, however far we may carry it, the polygon will never in any finite time and under the conditions of this its "natural law" of development, become a circle, for the simple, mathematical reason that *no variable ever attains its limit in finite time under the natural law of its development.* In the particular case before us, this fact should have been clear from the outset by the obviously antithetical character of the end indicated and encouraged by the cooperating units of the development, and the unity ultimately actualized. The ideal unity actually attained, was not the end sought after by the individual members of the Coenobium—not the end to which their natural instincts impelled them in carrying out the law of their natural development, but an end of a wholly different kind, thrust upon them in defiance of their natural instincts and the law of their development. In short, the unity ultimately attained was an unity thrust upon the community of independent organisms by a *power external and antagonistic to the energy working in the development.* The "spirit" of protozoan or unicellular development is essentially individualistic, and only communistic in so far as community or social life and cooperation minister to, and satisfy, individual wants and instincts of each organism. That a certain degree of social aggregation and coöperation is distinctly promotive of many wholly individualistic wants, and so attractive, is undoubtedly true, and to that extent social organization and cooperation are the natural product of unicellular development—a simple carrying out of its natural law. But, it is equally as obvious that this kind of social organization (inspired only by individualistic desires) is limited, and will never, and can never, go beyond a certain degree of natural social development. It is obvious that it will never, and can never, be carried by the natural impulses of the individuals concerned, to a point where it will infringe upon, and prohibit the further indulgence of these very natural, individualistic impulses which are producing it. That some energy foreign to their nature and altogether antagonistic to this law of their natural development, may—at this point—compel them still further to cooperate and coordinate in a higher and more stable form of unity, may be true indeed, but this is a wholly different proposition. In short, what we are endeavoring to point out is that the unity actually realized at the end of unicellular development (*viz: multicellular individuality*), can never be accounted for in terms of the natural development of unicellular life itself. It is not the product of the natural life and evolution of unicellular organisms, following out their innate instincts and propensities in strict obedience to the natural law of unicellular development; but, on the contrary, must be, and can be, accounted for, only upon the assumption that *another* power, *foreign to the natural development,* has suddenly invaded the Coenobium *ab extra,* interrupting all further progress under the natural law of unicellular evolution, and has metamorphosed the aggregation of individuals into a *new order* of unity altogether—has metamorphosed a *society* into an *organism.* This means that although the end, ideal, or limit of the development was, indeed, multicellular individuality, yet this limit was not, and could not have been, attained by the development in any finite time operating under its natural law of evolution (as no limit is ever attained by such a process) but was actually attained through the operation of a higher power without or external to the development, "interrupting" its further progress, and suspending its "natural law." It will be seen, then, that the energy acting within the development, while tending towards its limit, and the energy exerted upon the development when actually attaining thereto, are not only distinct, but antithetical. Speaking generally, the energy by which a development is carried on, is *immanent, differentiative* and *analytic;* while the energy by which it is finally made to attain its limit, is *transcendant, integrative* and *synthetic.* In a word, *Evolution is differentiation; Creation is integration.*

The final conclusion, then, to which we are led is clear and unmistakable. The transition from vegetal to animal life is one which cannot be accounted for in terms of a simple, uninterrupted process of natural Evolution. On the contrary, the evidence of an emergence—one of the most momentous in the entire course of organic development—is here apparent; an emergence which though primarily psychological in character—involving the appearance of an altogether new type of mind (*percipient mind*, as distinguished from *sentient mind*), also involves the appearance of a new biological type—a *neurobion* as distinguished from an *aneurobion;* an organism whose unity is expressed in the outward and visible mechanism of a centralized nervous system, rather than in a mere physiological cohesion of cells and tissues—in short, a true multicellular *organism* (individual) as distinguished from a mere multicellular *society*. No process of Evolution can explain the metamorphosis, for the plain reason that whether looked at from the psychological or the biological point of view, what is involved is not a differentiation, but an integration—the formation of a new integral or synthesis. The act of perception is itself an act of integration; the percept is a fusion of sensations, and thus, a new individuation, the product of a new synthesis. As already pointed out, the phenomenon of perception, or perceptual consciousness which meets us here, can no more be accounted for in terms of evolution (*i. e.*, a further differentiation of sensations) than any process of differentiation can be explained in terms of integration. They have nothing in common. In the same way, what is involved in the appearance of the true multicellular individual out of a multicellular society is again a process of integration, not of differentiation. Such an organism is a new individuation—the integration of a number of cell-individuals into a new order of unity or individuality. Hence again, it is to be explained only as a *new synthesis* or creation.

"The capital error," declares Bergson, "which has vitiated naturalistic philosophy since the time of Aristotle, has been to see in vegetative, instinctive, and rational life three successive degrees of one and the same tendency, whereas they are three divergent directions of one activity which has become tripartite in process of its increase. The difference between them is one of essential nature, not of degree." While by no means committing ourselves either to the language or the specific point of view of Bergson, we nevertheless subscribe fully to the general conclusion expressed here—*viz*: that both biologically and psychologically speaking the supposed evolutional continuity between these three orders of Life simply does not exist; but that, on the contrary, there is a distinct "chasm between the plant and the animal, and between the animal and man."

Just, then, as we explained the incarnation of life in inorganic matter after the analogy of the embodiment of magnetic energy in a bar of iron, so also, after the same analogy, we explain the embodiment of *anima* or soul (*i. e.* ψυχη or "psychic energy") in living matter—protoplasm. Even as the electrical current "magnetizes" the metal, so life "vitalizes" inorganic matter; and anima, in turn, "animates" living matter. The advent of each new form of energy imparts its own peculiar characteristics to the material upon which it works. In short, with each succeeding emergence some thing new "is builded on to the old" rather than "evolved out of the old," but in the act the old is simultaneously transformed—its potentials are re-arranged into an altogether "new synthesis."

ANEUROBIA (*Vegetal Multicellular individuality*)	NEUROBIA (*Animal neuro-muscular individuality*)
1. No nervous system.	1. Centralized nervous system
2. Diploblast—Two Germ Layers Ectoderm Endoderm	2. Triploblast—Three germ layers Ectoderm Mesoderm Endoderm
3. Acoelomata—Comprises Porifera Coelenterata, Ctenophora, etc.	3. Coelomata—Comprises Annelida, Echinodermata, Mollusca, Arthropoda, and Chordata (Vertebrata)
4. (Wanting)	4. Neuro-muscular system
5. (Wanting)	5. Mesoderm Derivatives— a. Muscular System b. Circulatory System c. Excretory System d. Osseous System, etc.
6. Radial Symmetry.	6. Bilateral Symmetry
7. (Wanting)	7. Metamerism
8. Primordial Unit—Cell	8. Primordial Unit—"Trochozoon," *i. e.* hypothetical primitive Trochophore (?)

{ *Evidence of Sexual Metamorphosis*
"Alternate Generation," *etc.* }

CHAPTER X

The Emergence of Personality

With the evolutional discontinuity between the Aneurobia and the Neurobia thus established, both from the biological and the psychological point of view, we come next to investigate the similar discontinuity alleged also to obtain between the highest multicellular animals and man. We have already seen that in the opinion of Wallace, Mivart, Wasmann, and other prominent scientists who accept the theory of Evolution, such discontinuity undoubtedly exists, and it now remains for us to point out, as briefly as possible, what are, in our estimation, some of the more potent reasons for maintaining this view. First of all, whatever may be affirmed as to the existence or non-existence of a physical nexus between man and animal (a subject to which attention will be presently directed), there can be little reason to doubt that a very formidable psychological gulf separates these two orders of being. It is in vain that materialistic scientists have endeavoured to bridge this chasm or minimize its significance. Not only has it time and again been pointed out by men of the highest scientific standing, but it is manifest even to the most superficial observer. We have already referred to the fact that men like Agassiz, Owen, Milne Edwards, Virchow, Beale, Dawson, and Dana, were so deeply impressed with the enormity of the chasm here revealed that they frankly denied the possibility of its being bridged by any natural process of Evolution whatsoever. Thus, Prof. Dana, characterized during his life-time as "the highest and gravest authority in American geological science," declared that "the method of Evolution admitted of abrupt transitions between species; but for the development of man there was required the special act of a Being above Nature, whose supreme will is the source of natural law."* And, again, writing in the *American Journal of Science*

Geology, p. 604.

and Arts, October 1876, p. 251., he says, "For the development of man, gifted with high reason and will, and thus made a power above Nature, there was required, as Wallace has urged, *a special act of a Being above Nature*, whose supreme *will* is not only the source of natural law, but the working-force of Nature herself. This I still hold." So also, Alfred R. Wallace, the co-discoverer with Darwin of the theory of natural selection, is no less emphatic in asserting that this theory is powerless to account for the intellectual and spiritual characteristics of man. "Because man's physical structure," says he, "has been developed from an animal form by natural selection, it does not necessarily follow that his mental nature, even though developed *pari passu* with it, has been developed by the same causes only."* Speaking of the unique intellectual faculties of man, he says—"These facts taken in their entirety compel us to recognize some origin for these faculties referred to, wholly distinct from that which has served to account for the animal characteristics of man, whether bodily or mental. The special faculties we have been discussing *clearly point to the existence in man of something which he has not derived from his animal progenitors*—something which we may best refer to as being of a spiritual essence or nature, capable of progressive development under favourable conditions. On the hypothesis of this spiritual nature superadded to the animal nature of man, we are able to understand much that is otherwise mysterious and unintelligible in regard to him, especially the enormous influence of ideas, principles, and beliefs over his whole life and actions."§ He has also been quoted as saying of the Darwinian theory that "it shows us how man's body may have been developed from that of the lower animals under the law of natural selection; but it also teaches us that we possess intellectual and moral faculties which could not have been so developed, *but must have another origin, and for this origin we can find an adequate cause only in the unseen universe of Spirit.*"

In short, man is to be placed "apart, as not only the head and

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**Darwinism*, p. 463.

§*Id.* pp. 473, 474.

culminating point of the grand series of organic nature, but as in some degree a new and distinct order of being."*

Again we find LeConte enlarging on the same view in defense of his assigning to the human period a complete geological "age"—"*The Age of Man*." "In regard to the distinctness and importance of this era," says he, "there are two views which will probably ever divide geologists, depending on the two views regarding the relation of man to Nature. From the purely structural and animal point of view, man is very closely united with the animal kingdom. He has no department of his own, but belongs to the vertebrate department, along with quadrupeds, birds, reptiles, and fishes. He has no class of his own, but belongs to the class Mammalia, along with quadrupeds, Neither has he an order of his own, but belongs to the order of Primates, along with the monkeys, lemurs, etc. Even a family of his own, the Hominidae, is grudgingly admitted by some. But from the psychical point of view, *it is simply impossible to overestimate the space which separates man from all lower things*. Man must be set off not only against the animal kingdom but against the whole of Nature besides, as an equivalent: Nature the book—the revelation—and man the interpreter. So in the history of the earth: from one point of view the era of man is not equivalent to an era, nor to an age, nor to a period, nor even to an epoch. But from another point of view, it is the equivalent of the whole geological history of the earth besides. For the history of the earth *finds its consummation, and its interpreter, and its significance, in man*."**

Other eminent Evolutionists,§ from the very beginning of the controversy have taken similar ground, but it is sufficient for our present purpose to cite the words of two recent authorities—Prof. Erich Wasmann—the well known entomologist of Luxemburg, and Prof. Henry Fairfield Osborn, of Columbia University. Prof. Wasmann belongs to that already large and growing class of scientists who believe that Evolution is poly-

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**Natural Selection*, p. 324.

***Elements of Geology*, pp. 557, 558.

§Mivart's views have already been cited—Ch. I. q. v.

phyletic, rather than monophyletic, and is out-spoken in his belief that man is a genuine biological emergence—a *new creation.* Says he, "We can account for the existence of man only by assuming some special action on the part of the Creator, this special action being the creation of the human soul; for God's almighty Power cannot have produced the soul, which is a spirit, out of matter, as it produced the forms of plants and animals. No evolution theory is capable of bridging the gulf between the mind of man and matter, which our experience teaches us really exists. It is far greater than the gulf between inorganic matter and organized substances, or that between vegetative and sensitive life; its width is such that it will never be bridged, just because mind and matter are diametrically opposed. Modern monism has, of course, forgotten this ancient truth, and is doing its best to ignore the essential difference between them, but it is successful neither in the mental physiology of man, nor in the comparative psychology of man and beast. . .Materialists are only wasting their time when they collect stone after stone and fling them into the abyss; the stones vanish like dust in a bottomless pit, and the gulf remains as wide as ever. . .The essential difference between the mental life of man and the sentient existence of beasts, and the impossibility that an alleged brute ancestor of man should ever have become the first *Homo sapiens* by natural Evolution, are facts that cannot be set aside. Therefore, it is a real 'postulate of science' to account for the mind of man by an act of creation."* While containing some statements and expressions with which we cannot entirely agree, we nevertheless cite the above passage with entire approval in so far as it emphasizes the fact of a great chasm between the minds of man and brute, as also between the realm of the inorganic and the living and again between vegetal and animal life—chasms which no mere process of Evolution has ever explained.

The views of Prof. Osborn have already been quoted in Chapter I, and it is unnecessary to do more than cite his brief, but categorical statement on this point—*viz*: that "the spiritual

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**Modern Biology*, pp. 283-285.

faculties of man cannot be accounted for 'by purely evolutionary processes,' " and again, that the mathematical and artistic faculties peculiar to man are also "new attributes to the human race without antecedents, and not to be accounted for by Evolution."*

But besides these, and many other frank acknowledgments upon the part of eminent authorities which might be cited, as to the reality of a "break," at this point, in the continuity of the evolutionary process, there have been many other indirect and unwilling admissions upon the part of those who strive and strive vainly to bridge the gulf. Prof. LeConte's position, for example, is one which is involved in hopeless contradiction. He is convinced, he tells us, that the process of Evolution is "paroxysmal" in character—that it has been marked by successive "individuations" of the cosmic energy, and that at each of these "individuations" (plant life, animal life, human life) the new and higher type of life, so abruptly ushered in, differs from the lower, "not only in degree, but also *in kind*". Moreover, he contends that these "successive individuations" attain to completion (*i. e.* to complete individuation or, what is the same thing, complete individuality) only in man who is thus, *psychologically* and *spiritually* a new creation—a thing apart—"separate from nature"—a "free, self-acting spirit". "The more we reflect on this subject," says he, "the more we shall be convinced that completed spirit individuality explains, as nothing else can, all that is characteristic of man. It is this which con-

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*It is interesting to note that Prof. Osborn apparently regards this last "emergence" (*i. e.* of the higher intellectual and moral faculties) as having occurred within the human period—primeval man not possessing such powers. He says, "The caveman bore and still bears, an evil reputation of being a brute, because few people recognize that during the long cave period there were two entirely different types of man—one of an extremely ancient lower order, known as the Neanderthal race of hunters, suddenly succeeded in Europe by one of much higher order, known as the Cro-Magnon race of artists. The creation of this man of a higher order, with his moral, spiritual, and intellectual powers, is utterly incomprehensible as purely a process of the survival of the fittest," (*The Earth Speaks to Bryan*, p. 55). This view is not new. It has long been advocated by defenders of the old "Preadamite" hypothesis. It was ably defended by Prof. Winchell in his well known work *Preadamites*, published 1880, and it has long been a favorite speculation with the writer himself.

stitutes person, or the self-acting ego. It is this which constitutes self-consciousness, free will, and moral responsibility. And out of these, again, grows the recognition of relations to other moral beings and to God, and therefore ethics and religion. Out of these, also, grows the capacity of indefinite voluntary progress. This also means separate life, spirit-viability, or immortality. Self-consciousness especially seems to me the simplest sign of separate entity or spirit-individuality, and its appearance among psychical phenomena, the very act of spirit-birth. We may imagine man to have emerged ever so gradually from animals: in this gradual development the moment he became conscious of self, the moment he turned his thoughts inward in wonder upon himself and the mystery of existence as separate from Nature, *that moment marks the birth of humanity out of animality.* All else characteristic of man followed as a necessary consequence. I am quite sure that if any animal, say a dog or a monkey, could be educated up to the point of self-consciousness (which, however, I am sure is impossible), that moment he (no longer it) would become a moral, responsible being, and all else characteristic of moral beings would follow. At that moment would come personality, immortality, capacity of voluntary progress; and science, philosophy, religion, would quickly follow.

"We have emphasized self-consciousness as the most fundamental sign of spirit-individuality; but a difference of exactly the same kind is found running through the whole gamut of human faculties as compared with corresponding faculties in animals. As animal consciousness is related to human self-consciousness, so exactly is animal will to human free-will, animal intelligence to human reason, animal sign-language to rational grammatical speech of man, constructive art of animals to true, rational progressive art of man. In every one of these the resemblance is great, but the difference is immense, and not only in degree, but also *in kind*. . .The change from one to the other is like to a birth into a higher sphere, the beginning of another Cycle of Evolution."* It will be observed here

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**Evolution and its Relation to Religious Thought*, pp. 323, 324.

that LeConte not only regards the difference between man and animal as *fundamental* in character (*i. e.* a difference "not only in degree, but also *in kind*"), but he further expresses the opinion that the special sign of this new birth of "free, self-acting spirit" is the appearance of "self-consciousness." In short, in his view, all the remaining psychological characteristics which are peculiarly human—distinguishing man from the animal—are only the natural consequence of the exercise of this new faculty. This is also the view of Romanes, and, indeed, of most investigators. "The whole distinction between man and brute resides in the presence or absence of conceptual thought, which in man is but the expression of the presence or absence of self-consciousness"*

There is little reason to doubt the validity of this very generally received opinion, but the further question presents itself. What is the nature of this self-consciousness? How is the appearance of this new faculty to be explained? With curious inconsistency, Prof. LeConte contends that here in the appearance of this new self-conscious energy, even as was the case in the appearance of life itself millions of ages before, we are face to face with a change which is one not merely of degree, but *of kind***—one which can only be compared to "the passage from one plane upward to another"—"not a gradual passage by sliding scale, but *at one bound*"—"*like a birth* into a higher sphere"—one in which the "new thing" is endowed with "new and wholly unexpected properties and powers, entirely different from those of its components,"[§] and yet (in spite of these admissions) one in which the "new and higher form of force" is, in some way, "derived from the preceding."[§§] "Ages upon ages passed away," says he, "until the time was ripe and conditions favorable, and life appeared—*a new and higher form of force,* producing a still more peculiar group of phenomena,

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*Romanes: *Mental Evolution in Man,* p. 175.

***Id.* p. 315.

[§] *Id.* p. 315.

[§§] *Id.* p. 316.

but still, as I believe, *derived* from the preceding.* Ages upon ages again passed away, during which the life-force took on higher and higher forms—in the highest foreshadowing and simulating reason itself—until finally, when the time was fully ripe and conditions were exceptionally favorable, spirit, self-conscious, self-determining, rational, and moral, appeared—a new and still higher form of force, but still, as I am persuaded, derived from the preceding."§ Now we should like to ask, how can one thing which is said to differ *in kind* from another, because it possesses "properties and powers, entirely different from those" characteristic of this other, be *derived* therefrom? That a "new thing," *b*, may be "derived" from *a* as a consequence of some re-arrangement of the properties characteristic of *a*, within the definite limits of variation prescribed by the Logos of *a*, we readily admit, but, in such cases, *b*, does not differ fundamentally or "*in kind*" from *a*, but is merely a different "variety" of *a*. Its fundamental character is of the same kind as that of *a*, for it is prescribed by the Logos, or essential character, of *a*. *To differ in kind, it must differ in Logos.* In short, we are here confronted with the same problem whose elucidation was given in the chapter dealing with the "Philosophy of Evolution." We there dwelt at length upon the lesson furnished us by that simple, but instructive toy, known as the kaleidoscope, to point our meaning. The possible "combinations" or "syntheses" of the bits of colored glass within the instrument are many indeed, but they are, nevertheless, limited by its essential character—that is, the number and colors of the bits of glass, and the value of the determining angle formed by the reflecting mirrors. No "syntheses" are possible, for example, which reveal colors different from those characteristic of the enclosed bits of glass, or "ratios" (*i. e.* relations between such colors) not mathematically deducible from "the determining angle" of the instrument; and if we should come across such

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*It must be remembered, too (as pointed out elsewhere) that he squarely maintains that "life" in relation to "chemical laws and forces" is "supernatural and miraculous," as is also "the free, self-determined phenomena of reason" in relation to "life." In each instance the higher is miraculous and supernatural because inexplicable in terms of the lower. (*Id.* pp. 356, 357).

§*Id.* p. 316.

"syntheses" we should be forced to conclude that they were the production of a different instrument altogether—an instrument possessing different "potentials" and a different "Logos". In short, such "combinations" would be construed as different "*in kind*" from those produced by the particular instrument with which we were familiar, and therefore, incapable of being "evolved" in any way out its integral of potentials. Now if it were possible for us to explain the self-conscious determining activity of the human mind in terms of the purely perceptual consciousness and instinctive activity of the animal mind, and the course of human evolution as a mere extension, on a wider scale, of the normal course of animal evolution, we should be compelled to acknowledge that whatever "new synthesis" or "combination" of potentialities might be manifest in this new being, man, there would be no reason for us to regard him as "a thing apart", or different "in kind" from his fellow mammals. We would have every reason to believe that he was logically "derived" from the same integral, a normal "evolution" thereof; in short, that he was a genuine animal, differing only "*in degree*" of development, but not "*in kind*" from other animals. But when LeConte freely admits that this new "individuation" is altogether too remarkable to be explained in such manner—that man differs from the animal "not only in degree but in kind," and that instead of regarding human evolution as a mere continuation of the former process going on in the animal sphere, we must account it as "the beginning of another cycle of Evolution"—"a birth into a higher sphere," it is obvious that he surrenders the whole point at issue. For how can man be different "in kind" from an animal, and yet nothing more than a natural evolution or "unfolding" of what was potential in the animal; or how can the change from animal to man be "the beginning of another cycle of Evolution," and yet, simultaneously, nothing more than the uninterrupted continuation of the former cycle? If it be the beginning of another cycle, different "in kind" from the former, it is obvious that the former has been discontinued—that a "break" or "interruption" has here occurred. The former has been dis-continued, the latter inaugurated *de novo*—*i. e. created*. In the very description which LeConte has given us of this "individuation," therefore, it is evident that we are face to face with one of those remarkable phenomena now referred to as "*emergences*"—phenomena which cannot be accounted for as simple "products" of antecedent evolutions (because "resultants" which are "too large" for the "components" of such antecedent developments) and which can logically be explained only as "*creations*" of extra-developmental energy. Indeed, on the psychological side this discontinuity between man and brute is so conspicuous, and so generally recognized by all but a certain class of Evolutionists, that it is difficult to understand how it can be seriously questioned. How can the *subjective* consciousness of man be explained in terms of the *objective* consciousness of the animal? Will any amount of purely perceptual experience—the experience of phenomenal objects—produce the experience of self-consciousness—the experience of an a-phenomenal subject? Can the consciousness of the ego be explained in terms of the experience of the non-ego; the noumenal in terms of the phenomenal? Can subjective experience, in other words, be nothing more than a combination of the data of objective experience, and so "derived" or "evolved" therefrom? Can you build a brick house out of wooden materials? The very question is absurd. Will any amount of persistent "looking outward" from the window of your room, result in a vision of what is within it? The animal may go on accumulating such objective experiences forever, but no number of, or degree of coordination among, such experiences, can ever produce a subjective experience. The process which leads to the latter is not only not a "continuation" of the process going on in the former, but it is the direct *opposite* of the former process. The former is outward, the latter is inward; the one is centrifugal, the other centripetal; the one is differentiative, the other integrative; the one is an evolution, the other is a creation. The truth is that the conditions which here surround the sudden appearance of self-consciousness, in the transition from animal to man, are precisely analogous to those which surrounded the appearance of perceptual consciousness, at the transition from vegetal to animal life; precisely those again which surrounded the appearance of vitality, at the point of transition from the inorganic to the organic. In each case, the "new synthesis" is altogether inexplicable in terms of a "derivation" or an "evolution". Just as we found it impossible to account for *life* as a simple "resultant" of chemico-physical reactions, or, in any sense, the "product" of non-living matter and motion; just as again, we found it impossible to explain *mind*, or perceptual experience in terms either of unconscious molecular vibrations and mechanical reflexes, or as the product of the persistence of unlocalized "feelings" alone; so also do we find it equally as impossible to account for subjective, a-phenomenal self-consciousness, and ideation, in terms of the objective, phenomenal consciousness of perception. The phenomena of *life* demanded the presence of a peculiar vital agency external to the physical and chemical forces involved; the phenomena of *mind* (*i. e.* perception), the presence of another peculiar psychic agent (attention) external to the sensations involved; and so the phenomena of *ideation* and *representation*, in turn, demand, the presence of yet another peculiar spiritual agent (self-conscious, self-active ego, will) external to the percepts involved. No one of these "emergences," in other words, can be accounted for as simple "products" of any evolution of the antecedent "materials," (although these have indeed been absorbed into them), but are in each case manifestly *creations* of extra-developmental agencies.* Summing up the matter, we thoroughly agree with Wallace in his contention that the actual facts, in each case, warrant the idea of "successive spiritual influxes"—(1) with the origin of life, (2) with the origin of mind; and (3) with the origin of human personality.

But while it is on the psychological side that we particularly stress the matter of "discontinuity" in the case of man, yet it must not be inferred that the "spiritual influx" has left no marks of its effects upon the physical structure. In each instance, these structural peculiarities are manifest, and in the case of the human brain, they afford evidence of a most convincing character. This is not generally known. On the contrary, the com-

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*The further, indisputable evidence that a genuine creative act is involved in every transition which our minds effect in rising from the experience of a singular to the experience of an universal notion (general idea), has already been pointed out in the last chapter. (*q. v.*) The importance of this fact cannot be too greatly emphasized.

mon impression is that, beyond the enormous development of the cerebral hemispheres in man, no structural distinctions of any importance between him and the ape have ever yet been discovered, and that it is precisely in the absence of any such essential, structural peculiarity that the highest evidence for an evolutional continuity between the two is established. Now if all that is meant by this commonly heard argument is that there is no conspicuous physical distinction to be discovered—well and good. If, on the other hand, the statement is made with the intention of conveying the impression either (*a*) that no structural variations of any kind whatever are discoverable; or that (*b*) some of those which are discoverable because of their inconspicuous character, cannot, on that account, be of any *essential* importance—we must at once enter a categorical denial. That genuine structural and functional variations, peculiar to man, do really exist, is now well established, and that some of these apparently minor peculiarities have, upon closer examination, proved to be of far-reaching importance, we shall now proceed to show. First of all, however, we must warn our readers against the fallacy of supposing that what from a purely physical point of view may be a very small and insignificant change, may not—from a wider point of view—involve an inconceivably great transformation. From a purely physical point of view the change from a polygon of ten thousand sides to a genuine circle, is a very trifling variation—actually it is of a fundamental character. Chemically, the change from a highly complex, non-living carbon compound to the living protoplasm, appears to be of a very insignificant character—actually it is of infinite significance. So also, physically speaking, the change which took place millions of years ago from the highly differentiated protozoan society to the metazoan individuality was doubtless so gradual and inconspicuous to the eye, that could it have been observed at all, it would never have attracted serious attention—actually, however, the transition was one of the most momentous changes that ever occurred on this planet. It is a great mistake to imagine that changes of fundamental importance are necessarily conspicuous. It is only in their after *effects* that their real importance can be estimated.

Now it is well known to neurologists that over and above gross structures of the brain which can be easily observed and are known to be common to men and brutes; and over and above even those less easily detected, but still demonstrable, motor and sensory centers of the cerebrum which are likewise common, there are in man certain cortical areas intimately connected with the function of speech. These were formerly supposed to be confined within the limits of a very small area situated, generally, in the lower portion of the third frontal convolution of the left cerebral hemisphere, and because the evidence for the existence of a similar mechanism in the brain of the ape was totally wanting, this particular cortical center was rightly regarded as of supreme importance, because the organ for those peculiar intellectual powers which so sharply distinguish the mind of man from the mind of the animal. Thus, in commenting upon the significance of this "mechanism of Broca," Professor Cunningham in his address before the British Association, delivered only a short time after the discovery had been announced, did not hesitate to observe that "the structural characters which distinguish the human brain in the region of the speech-centre constitute one of the leading peculiarities of the human cerebral cortex. They are totally absent in the brain of the anthropoid ape, and of the speechless microcephalic idiot". Now whatever may be said of the precise locality of this organ, the mere existence in the human brain of such a tract or region, which could be duplicated in the case of no other mammal, when taken in connection with the infinitely greater powers of the human intellect, was in itself a fact of sufficient magnitude to call for serious reflection upon the part of those Evolutionists who could detect in man no physical peculiarity corresponding to these admittedly great psychological peculiarities which are his essential characteristics; but even this was only the beginning of a series of implications which were soon to follow.

We cannot now enter into all the ramifications to which this startling discovery led, but it suffices for our present purpose to say that its implications in the domain of practical pathology were as far reaching as in the domain of theoretical science, and it was not long before our text-books on physiology and neurology were full of the subject, and the theory generally accepted in medical circles. We cite the following at random. "*Center of Speech.* Pathologic investigations have demonstrated that the left third frontal convolution is of essential importance for speech. Adjoining this convolution are the centers controlling the mobility of the lips, tongue, etc. In the majority of cases the speech centers are on the left side of the brain, though in exceptional cases they are on the right side, especially in left-handed persons. *In deaf mutes this convolution is very imperfectly developed, while in monkeys it is quite rudimentary.* Lesions of the third frontal convolution on the left side, if the patient be right-handed, produce the various forms of aphasia, or the partial or complete loss of the power of articulate speech."* The author then proceeds to point out, in greater detail, the various "degrees and kinds" of aphasia met with, and their specific connections with this center. Almost any text-book on physiology, neurology or psychology, appearing during the last decade or more, deals with the subject, so that it is unnecessary to multiply quotations, and we content ourselves, therefore, with adducing but one of more than ordinary importance. The words of Prof. C. Judson Herrick—one of the most eminent neurologists of America—are entitled to more than usual respect. In the third Edition (1922) of his famous *Introduction to Neurology*, and in the chapter dealing with "The Functions of the Cerebral Cortex" he writes:—"Distinctive names have been given to the more important types of speech defect as clinically observed; such as agraphia or inability to write correctly, aphemia or inability to utter words, word-blindness (alexia) or inability to comprehend written words, word-deafness or inability to comprehend spoken words, and many others. . .(The) Motor type of aphasia usually, though not invariably, results from injury to the posterior part of the inferior frontal gyrus of the left hemisphere in right-handed persons and of the right hemisphere in left-handed persons. This relation was first discovered by Broca, and the area of motor speech correlations has since been termed Broca's convolution. . . . .The correlations in-

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*Albert P. Brubaker, M. D., *Compend of Human Physiology*, p. 215.

volved in the motor functions of speech appear to be represented typically in only one hemisphere, though this is by no means rigidly true. The corresponding structures in the other hemisphere may cooperate in these functions normally, and after loss of speech from a unilateral lesion speech may be reacquired by further education of the uninjured centers of the same or the opposite side. It has recently been shown that Broca's convolution is often larger on the left side of the brain than on the right side and that the average thickness of the cortex in this region is greater on the left side."*

But while these citations from eminent authority are amply sufficient to establish the reality of such a mechanism in the human brain, as well as to indicate its great significance in pathology, yet there are other implications of the theory which must now be considered. As already stated, it was early noticed that this mechanism was absent from the brain of the ape and even from that of the microcephalic idiot, but it was soon to be pointed out that it was likewise absent in the normal human infant, and only came into existence as the result of education—that is to say, only as the result of repeated efforts upon the part of the human will. In a word, it was pointed out that this mechanism was nothing less than *a construction of the will of man,* and that when partially injured or even, under certain circumstances, when completely destroyed, could be reconstructed by the will in the opposite hemisphere. Indeed, taken collectively the facts seemed to warrant the following conclusions.

(1) That there is a fundamental physical structure in the brain of adult man that is altogether wanting in the brain of the human infant, as well as in the brain of the brute.

(2) That this material structure is both created and fashioned (elaborated) by the activity of the immaterial conscious energy of the human *will* and is not (as materialism would have us suppose) a natural, inborn, physical peculiarity which itself conditions such subsequent volition and thought.

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*Id. p. 328.

(3) That the well known ability of man, under the conditions of education to fashion such a structural mechanism *at will,* side by side with the total inability of the animal, under similar conditions, to do the same, proves that there is in man a spiritual principle of conscious, self-determining activity which is not to be found in the animal. No one has more clearly pointed out the true significance of these facts than the late William Hanna Thomson, M. D., LL. D.—the well known authority on nervous diseases. In his work on *Brain and Personality* he presents the evidence accumulated by medical science from numberless observations and experimental tests, and is positive as to the truth of his conclusions. At the very outset he reminds us that this mechanism in question is ultra-microscopic. It can no more be *seen* under the microscope than the groupings of molecules and atoms which chemistry assumes elsewhere. Nevertheless, like these last material aggregations its existence can be scientifically demonstrated from a number of circumstances. It is unnecessary here, however, to enter into a detailed discussion of them. It is sufficient merely to cite the terse observation of Dr. Thomson that "a brain center used for speaking is certainly an actual material fact, or else it could not be destroyed by a pointed stick."* Again, "the material change" (wrought in the gray matter of Broca's Convolution in consequence of Will-Effort) "must be there, though no microscope will ever detect it, . . .but there it must be, or a blood-clot, or an umbrella-tip, could not destroy it".** "It is no more a theory than a finger is. . .it is a definite material thing."[§] But after all it is unnecessary to discuss this, as it is generally conceded by materialists that such a mechanism exists. Indeed, it is of the very essence of materialism that there can be no thought without the existence of a corresponding physical mechanism. Materialism has no interest, therefore, in denying the existence of such a specific mechanism in the brain, (as this would be suicidal) and is only concerned with the further allegation that this mechanism has been created by the activity of such an im-

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*Id. 221.

**Id. 120.

[§] Id. p. 196.

material conscious principle as the human will. From the point of view of materialism the very reverse should be the case. It is the pre-existence of the physical mechanism which determines the conscious activity, not the conscious activity which determines the mechanism. The mechanism establishes the thought, not the thought the mechanism. But it is this very citadel of the materialistic argument which the evidence presented by Dr. Thomson completely undermines. He proves that "it is not the brain structure, nor organization, nor locality, nor brain-cell or fibres, nor any similar thing which is the first cause of word making. The first cause is something wholly different, namely, an agency, or rather *agent,* which visits these brain localities, and finding them originally unfamiliar with a single word of any kind, proceeds by a long and incessant repetition process of teaching, to fashion those particles of gray matter to do what he proposes, here to receive words, there to utter words."* This is further revealed by the fact that "in childhood both hemispheres are equally teachable, and speech lost by damage to one, can be made up by education of the speech convolution in the other."§ In a word, observation and experiment have brought to light the significant fact that in early childhood no mechanism exists in either hemisphere of the brain, and it is only after repeated efforts of the will have been made in response to parental or other education that the child constructs such a mechanism. Moreover, it has been further shown that while, at the beginning, and for reasons which are not well known, the left rather than the right hemisphere is chosen in the majority of cases, and the mechanism established in the inferior portion of the third frontal convolution, yet, in the event that this portion of the brain is subsequently injured, and the mechanism destroyed, the conscious will can even then—after prolonged effort—construct a new mechanism in the corresponding convolution of the right hemisphere, thus demonstrating beyond all question the fallacy of the materialistic position, and establishing the fact that it is the will or conscious principle which creates the mechanism and not the reverse, that—in the language of Cope—"consciousness" has "preceded organism, and has been the *primum mobile* in the creation of organic structure." Thus—"many cases are reported of children becoming aphasic just as adults do, by the onset of right-sided paralysis with the destruction of the left Broca's Convolution, and yet they gradually learn to talk again in much the same fashion in which they acquired speech at first. That they do this by educating the centres in the right brain is proved by parallel cases of the supervention afterwards of total aphasia, when left-sided paralysis was added to their former right-sided paralysis, *i. e.* by a second injury involving the right centres."* Finally, the fact that this capacity for voluntarily creating an organ of speech in the tissue of the brain is characteristic of man alone —no such capacity being exhibited by the brute—further evidences the presence of a new and distinctive psychological principle in the former—the entrance of a new spiritual *agent* in the history of organic Evolution. On this point our author continues—"It is no longer doubtful that every race of men can be educated to know anything from reading and writing to mathematics, philosophy, and political economy. In other words, man is always and everywhere man, and infinitely distinct in mind from every ape."§ Man is a speaking being, the ape is not. In man, "at birth, speech has no place or locality whatever in either hemisphere." Both ape and man have the same convolution to which Broca has referred, but there is an "*agent*" in the human brain which can and does create a mechanism in one of these convolutions, which he henceforth employs as an organ of speech. In the brain of the ape no such agent exists, nor any evidence of such a material mechanism. The conclusion, then, is unavoidable. Just as the *anima* or attentive agent (soul) of the animal formerly descended into the aneuronic body of vegetal life and constructed therein a specific neuronic mechanism—*viz*:— the centralized nervous system—which it thenceforth proceeded to employ as the organ of its peculiar psychical activities; so also, at a later period, has a similar transcendental agent—the self-conscious spirit (self-active will) of man, in turn, descended

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*Id. pp. 108, 109.

§Id. p. 196.

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*Id. pp. 126-127.
§Id. p. 117.

into this neuronic body of the animal, and constructed therein a yet higher mechanism—the so-called mechanism of Broca—which it now proceeds to employ as the organ of its still more unique intellectual and spiritual activities.

Now we are quite aware that there are some who will take exception to the foregoing argument, alleging that recent psychology has changed front on the subject of Broca's mechanism, and now denies that any such mechanism exists in the brain. But this is a very serious mis-statement of the actual situation to-day. It is not true that the existence of a Broca's mechanism has been disproved in the sense that neurologists no longer affirm that an organ of speech exists in the brain, but only has it been shown (*a*) that in the opinion of *some* authorities the actual mechanism of speech can no longer be regarded as a specific center, or confined within that particular area of the cortex so designated; and that (*b*) our conceptions of its character have also undergone profound modification. Even where certain psychologists have struck the expression ("Broca's mechanism") out of their text-books, it does not mean that they have abandoned the idea that a speech mechanism of some kind exists, nor does it invalidate the above argument of Thomson that such a mechanism has been actually constructed by the will in the course of education. As already stated, no modern scientific writer can escape the assumption that some kind of mechanism is there without, simultaneously, violating what might be called an axiom of modern science, *viz*: that there can be no thought apart from a physical organ of some sort. This would be to assume that man can think without a brain. The very association tracts which are universally assumed to exist as intermediaries between the sensory and motor centers involved in speech are themselves mechanisms, whatever their precise constitution may be. We may not understand their specific character, but inasmuch as we know that they are spatially defined tracts or pathways for energy coursing between definitely localized sensory and motor centers, we know that (for that reason alone) they are objective, organized entities—mechanisms, moreover, which in the case of language, have been fashioned by the will in the process of education and which did not exist prior to such operation of the will. Again it is not necessary to suppose that they are visible structures, and even Dr. Thomson, in the foregoing argument, was careful to emphasize this point, comparing them rather to the molecular and atomic "arrangements" assumed by chemistry and physics to explain certain phenomena within their respective fields. We might add that Weismann's theory of the germ plasm, and the more recent hereditary hypotheses of the geneticists all assume similar invisible mechanisms, in their specific fields, and it would be easy to mention others. We do not, in the case of psychology, any more than in the case of genetics, pretend to understand the precise nature of these mechanisms, but there can be little doubt as to their actual existence. Whether, therefore, we attempt to explain them in terms of "engrams," "neurograms," "physiological schema," or—with greater plausibility—upon the assumption of altered synaptic resistances, we must, in any case, assume that they are actual physical modifications of brain substance arising under the influence of repeated acts of volition carried on in the process of learning or education. It may even be true, as the recent researches of Lashley seem to suggest, that such a mechanism may be compared to an intricate net-work streching over a wide area of the cortex, so that even when considerable portions of its structure are destroyed, connection between the sensory and motor centers is not necessarily interrupted.

But while these and many other suggestions are worthy of consideration, and any one of them, if proved true, would greatly alter the older conception of the nature of the apparatus involved, it would not in any sense invalidate the fact of its existence, or, in any sense, diminish the cogency of the argument set forth above. Moreover, we must remind our readers that "learning" of a certain kind can undoubtedly be carried on without the use of language and because experiments with rats, or other animals, may lead to the conclusion that this kind of learning may be acquired through the instrumentality of other portions of the cortex, it by no means follows that the particular kind of learning with which we are here concerned—that carried on by the use of language in the course of education, and which is peculiar to man—must be explained on the basis of these more remote mechanisms of the cortex. Indeed, if this were true the mystery would be deeper than ever, as there would be no clear reason why animals should not be taught to read, write, and acquire an education such as man enjoys. Whatever, therefore, may be the findings of Lashley and others with respect to that kind of learning which may be accomplished without the employment of language, it remains an undeniable fact that the disturbances of speech are so generally associated with injuries of the Broca area, that it is difficult to escape the conclusion that this particular region of the cortex is intimately connected with language.

Thus we are not surprised to find so able an authority as Prof. Ranson—in spite of the fact that he advises caution in the matter—citing with evident approval the views of Campbell (1905) that the "intermediate precentral area" (that portion of the frontal cortex immediately rostral to the motor projection center) should in all probability be regarded as "especially concerned with the 'execution of complex movements of an associated kind, of skilled movements, and of movements in which consciousness or volition takes an active part.' "* A little further on, he proceeds to point out that this "intermediate precentral area" of Campbell is identical with Broca's mechanism, and deals with the function of speech. Thus, he continues, "some idea of the significance of the so-called association centers may be obtained from a study of the group of speech defects included under the term 'aphasia'. In right-handed individuals these result from lesions in the left hemisphere. Destruction of the triangular and opercular portions of the inferior frontal gyrus usually causes loss of ability to carry out the coordinated movements required in speaking, but does not impair the ability to move the tongue or lips. This defect is known as motor aphasia. *Broca's center, as this particular part of the cortex is sometimes called, is located in Campbell's intermediate precentral area; and motor aphasia serves as a good illustration of the importance of the entire intermediate pre-*

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central area for the execution of skilled volitional movements of an associated kind. In the same way, after a lesion in the posterior part of the left superior temporal gyrus, the patient may hear the spoken word, but no longer comprehend its meaning. This is sensory aphasia or word deafness. Word blindness, the inability to understand the printed or written language, although there is no impairment of vision, may result from lesions in the angular gyrus. These three areas are often spoken of as speech centers and are closely united together by association fibers. In fact, it is not altogether clear to what extent such defects as those mentioned above are dependent upon the destruction of the association tracts which lie subjacent to the speech centers."* He further subjoins a diagram (Fig. 225) entitled "The cortical areas especially concerned with language," in which the "Motor speech area," "Auditory speech area" and "Visual speech area" are each definitely outlined.

To this we may add the testimony of Pillsbury as given in his *Essentials of Psychology*, Third Edition (1930); for although he admits that Lashley and Head "have argued that the functions in the brain are not so definitely localized as we have pictured them," and that "the question is still open," he evidently inclines to the older view. "We know that these areas are necessary to speech, because speech becomes defective in case either is injured," and that even when recovery occurs, he continues "it must be ascribed in larger measure to the development of new paths to take the place of the old, to the transfer of the functions to portions of the cortex not previously used[§]—a view which is, of course, thoroughly in line with that of Thomson already cited.

Again, Prof. Sandiford of the University of Toronto, in his *Educational Psychology* (1931) also definitely affirms the existence of such a mechanism of speech, peculiar to man and wrought under the influence of education—*i. e.* voluntarily. "Besides the visual and auditory areas mentioned above, two

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*Id. p. 297.
[§] Id. pp. 44-47.

other areas—the motor speech and writing areas—are concerned with language. The interconnections among them are shown in Fig. 33. The speech and writing centres are excellent examples of what have been called super-motor centres. It is probable that the motor areas extend beyond the boundaries of the pre-central gyrus, the outlying parts being solely concerned with such delicate muscular adjustments as are necessary in speech, writing, and skilled movements. It is possible to lose the adjustments for speech and writing, *etc.*, without losing the cruder adjustments for walking and for moving the arms."* He then proceeds to point out that these higher "complex neuron connections" which because they are the mechanism for speech are, of course, peculiar to man, *originate under the influence of education.* Thus, he continues, "the connections of the nervous system necessary for survival are born with us," but "to these we add thousands of others through the process of learning. . .So far as crude living is concerned the lower arcs of the central nervous system are all that are necessary. Compared with these fundamental arcs those formed by education within the walls of the schoolroom seem of little consequence. But with man's evolving nature the lower arcs become inadequate. The brain with its thousands of upper arcs grows, develops, and becomes functional. The 'learning brain' contrasted with the 'living spinal cord' thus puts us in intimate relationship with the great world of knowledge we call civilization. Man's abundance of connectible neurons, therefore, makes him human. *It is training and education that lead to the higher and more complex neuron connections, and place man far above the level of the beast.*[§]

With these quotations, selected from some of the most recent authorities, now before us, it should be obvious that the facts upon which we base our argument remain secure.

In short, the recent tendency to deny the existence of a Broca's mechanism as a specific centre of speech, must not be interpreted to mean that neurologists no longer believe that there

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*Id. pp. 113, 114.
[§] Id. pp. 114, 115.

is any kind of mechanism of speech to be found in the brain. Such a conclusion is wholly unwarranted by the evidence, and is in further violation of the fundamental assumption underlying the entire approach of physical science to the problem. But because it stands to reason that some kind of mechanism must be present, it does not follow that the specific centre of Broca necessarily meets all the conditions of the problem. Hypothetically, such a mechanism may be localized in a specific centre, or it may form a net-work of association tracts, covering a considerable region of the brain, and interconnecting specific sensory and motor centres. In either case, however, we are dealing with a localizable physical structure. Moreover, all the evidence goes to show that such a physical mechanism is not congenital, but acquired. In short, it is a mechanism which has been slowly and progressively *constructed by effort of the will in the process of education,* in the case of every human individual. But even this is not all. Not only is such a mechanism shown to be a construction of the will, through the evidence naturally presented in the course of ordinary education, but the further circumstance that when any portion of such a structure has been destroyed, through accident or disease, the same will can, under certain conditions make good the defect by rebuilding another, similar structure elsewhere—even in the opposite hemisphere of the brain—only serves to make this interpretation of the matter the more conclusive. Indeed the very fact that the function of speech is not hopelessly and invariably tied to any one locality in the brain (however commonly it may be associated with one alone), so far from being an objection to the theory, as many of its opponents appear to assume, is its crowning confirmation.

Summing up the entire matter, then, we may affirm that whatever modifications the theory of Broca may have undergone of late, the indisputable evidence remains that *some kind of speech mechanism is present in the human brain, and that this mechanism is constructed by no other agent than the will of man himself, incessantly exerted in the long, laborious process of education.* On the other hand, inasmuch as no brute can be taught to speak, not only is it obvious that he possesses no such mechanism, but the implication is clear that he has not in him the necessary power (*i. e.* the self-determining will) to construct such a mechanism.

In conclusion, then, we reaffirm that with the appearance of man, there has suddenly entered a new spiritual factor—a factor which cannot be accounted for in terms of the normal animal development leading up to it—a factor, in other words, which is not the naturally to be expected outcome of that evolution, due to the continued operation of its natural law, but an altogether unique and exceptional phenomenon—a true *emergence*—which can be accounted for only upon the assumption that a wholly new form of energy—that is, altogether foreign to that operating within the animal development, has invaded it *ab extra.* The peculiar powers and characteristics of the human mind, as Wallace remarks, "clearly point to the existence in man of something which he has not derived from his animal progenitors," and, therefore, something which can only logically be accounted for as the result of a "spiritual influx" wrought by some external agency. It is to be observed that it is the intellectual and spiritual nature of man of which we are here speaking. On the other hand, we have no desire to deny the possibility of a genuine connection between animal and man on the purely physical side. On the contrary, we emphatically assert the possibility of such a connection, but, in doing so, we are very far from asserting that this connection is necessarily an evolutional one. What we mean to say is that the body of man is not as it stands, the natural outcome or "product" of the continued evolution of the animal body, but a formation resulting from a complete metamorphosis of this animal nature wrought under the influence of an external spiritual agency;—a body, therefore, which though it possesses in itself all the potentials and elements of the animal, nevertheless has these potentials and elements now re-arranged into an altogether "new synthesis"—a new system; a system *which would never, and could never, have resulted from the mere continuation of the normal animal evolution.* It possesses within itself all the essential constituents of the animal nature without, in any sense, being an evolution out of that nature. Nor is there anything peculiarly mystifying or obscure about such a statement. Hundreds of illustrations of the principle could be cited. Because a loaf of bread contains all the constituents of the wheat, are we to infer that it is a natural evolution from the wheat? Do biscuits grow out of the ground? Can we pick ready-made suits from the cotton stalk? Because all the bricks which enter into its construction have been formed out of clay, are we to infer that the cathedral has naturally "evolved" out of the clay-bank?

Briefly, then, we believe that while man, on his bodily or physical side, is "of the earth earthy"—akin not only to the animal, but even to the plant and the mineral (because mere "dust of the ground"—*i. e.* built out of the same fundamental chemical elements), yet he is not a natural evolution therefrom; he is, in reality, a "thing apart"—a new *creation;* a genuine "*emergence*" wrought by the influx into the mere animal nature of a transcendental spiritual power. And what is true with regard to man, is true of those emergences which preceded him. Though the protoplasm of the plant contains the same chemical elements that are to be found in the mineral, yet the living matter of the plant is not an evolution out of the non-living mineral, but a new creation, formed by the influx of an energy *ab extra,* (vital energy); and though the animal, in turn, has been built up out of the same protoplasmic material that enters into the constitution of the plant, yet again the animal organism is not the result of a natural evolution out of the plant, but a new creation—formed by the influx of a foreign energy—a perceptual agent, *anima,* not to be discovered in the plant.

Moreover, this view which acknowledges a genuine physical connection between animal and man, while denying that such connection spells evolutional continuity; which, in other words, recognizes man as the *end* or *limit* of animal evolution, while denying that he is, in any sense of the word, a "*term*" in that evolutional sequence—is not only thoroughly in accord with all the facts actually known to science, but is also as thoroughly in accord with all the statements of Holy Writ. For this conclusion is, after all, only a further confirmation of the age-long teaching of the Church respecting the origin of man, based upon the statement of Gen. II. 7.,—that though on his *bodily* side man is, indeed, "of the earth earthy," yet, on his *spiritual* side he is the product of a special act of creation—the "in-breathing" of an extra-developmental or transcendental power. As it is expressed in the words of this sacred document—"The Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life, and man became a living soul." That is to say, God formed (fashioned) man's body out of "the dust of the ground" (*i. e.* out of the same material elements out of which He fashioned the animal body), but created his soul by breathing into this mere material and animal nature, the breath of His life divine. In short, we are taught here that the spirit of man—a direct emanation from God—descended "from above" into the nature of the animal and became "incarnate" therein as a "living soul," precisely as the same scriptures teach that, later on, the Divine Spirit, in turn, descended "from above" (ἄνωϑεν) into our human nature, and became "incarnate" therein as a "quickening Spirit".

To those, therefore, who find so intimate an association between man and animal to be revolting in the extreme—who cannot bring themselves to believe that the immortal soul of man (the very "image of God") could ever have been brought into contact and relation with the foul nature of the brute,—we merely reply that there is nothing more revolting or impossible in this idea than what is also involved in that very doctrine of the incarnation which, as orthodox churchmen, they most vigorously profess to believe. If God could take upon Himself the nature of man, why should not man take upon himself the nature of the animal? If God, the All Holy, could Himself descend into our "vile and corruptible" human nature, and become truly "incarnate" therein without spot of sin or contamination; why should not the immortal spirit of man likewise have descended into the corruptible nature of the animal, and become as truly "incarnate" in that nature? The purpose which the Divine Spirit had in descending into our human nature, was not to continue on that lower level, but to raise that nature to a higher level, to metamorphose the natural into the spiritual; to create a new type—the second Adam, spiritual manhood.* So also, the purpose which God had in infusing His "breath" into the animal nature, was likewise to raise that nature to a higher level, to metamorphose the animal into the human; to create a new type—the first Adam, natural manhood. Not only, therefore, is there nothing antagonistic between this view and the teaching of orthodox theology, but it greatly facilitates a broader interpretation of the real harmony of Nature and Revelation. We see that while there has not been an uninterrupted "Evolution," there has been an uninterrupted "Development" of the Cosmos. Creations and evolutions have alternated; that is to say, cycles of Evolution have originated and terminated with special creations—("emergences") wrought by the influxes of meta-physical agencies. Thus, at a certain point in the evolution of physico-chemical forces, the principle of life descends "from above" into inorganic Nature, and forthwith a "new synthesis" emerges—plant life. This, in turn, undergoes development (evolution), until, at a certain point it is overshadowed by a yet higher meta-physical principle. It is now a psycho-dynamic agency which descends "from above" into the living protoplasm of the aneurobic, vegetal organism and lifts it to a higher level—animal life. Animal life again evolves upward to the limit of its potentialities, only again to suffer a metamorphosis under the quickening influence of a yet higher spiritual agency, with the result that man appears upon the scene. Finally human life repeats the story, evolving upward to the limit of its potentialities, when humanity, in turn, is "overshadowed" by "*The Power From on high*" and CHRIST, the second Adam—the spiritual man appears—GOD INCARNATE—IMMANUEL.*

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*We purpose to treat this matter further on.

CHAPTER XI

Mind In Development

WE have now reached a stage in the development of our argument where it will be necessary to pause a moment and systematize the results at which we have arrived, as well as justify certain assumptions which have been made, but which could not hitherto be defended.

Our main contention is that it is to psychology rather than morphology that we must look to discover the true key to the classification of living organisms. It is first assumed that sentient life or *mind* is the creator of living protoplasm—the agent which manufactures therefrom the non-living organic and inorganic substances found in every organism, and which further distributes, arranges, or organizes the material so formed into the various cells, tissues, organs, and other structures which combine to express the specific plan or pattern or type. But while "bodily form" is thus necessarily subordinate to psychical character, (because, after all, but the expression of such psychical character), it must always be remembered that it is an expression of the mind or intelligence of the organism *under the conditions and limitations of the environment.* In short, the persistent, orthogenetic, rational effort of the organism to actualize all its potentials, and thereby "embody" its "Logos" in living matter is now favoured, now opposed, now permitted, now prohibited, by the surrounding circumstances or conditions of the environment, so that if the organism survive at all in the struggle for existence, its "form" is always a compromise between these equally persistent internal and external agencies. Just as men must build different kinds of houses when in different quarters of the earth, with different materials at hand, and with very different climatic and other conditions to be satisfied, so also in different localities, and under very diverse conditions of life or environment, organisms generally must build very diverse kinds of bodies. Moreover, it must also be remembered that just as men of the same grade of intelligence must, of necessity, build very diverse kinds of dwellings, under varying environmental conditions, so also is it true that under precisely the same environmental conditions, men of diverse grades of intelligence, will again build very different kinds of houses. Under the same physical conditions in which the North American Indian could build nothing more substantial than a humble wigwam of skins or branches of trees, the civilized American of to-day builds his edifices of brick and stone and steel. So also is it to be expected that organisms of very distinct grades of intelligence will succeed in meeting the conditions of the same environment very differently, and this difference will be expressed in the greatly divergent character of those "fleshly tabernacles" in which they live, move, and have their being. These two simple principles, therefore—(1) That there are diverse grades of mind or intelligence amongst living beings, which necessarily react to the influences of their environment upon as many distinct planes; and (2) that even organisms of the same grade of intelligence must, and will, react very differently to diverse kinds of environment—are alone sufficient to account for the numberless "*varieties*" of the same psychological type.

When we declare our belief in the principle of rational orthogenesis in organic Evolution, we do not pretend to affirm that the vital principle or intelligence works in defiance of all external conditions. On the contrary, we believe that there is a real "struggle for existence" going on between the intelligence of the organism, on the one hand, and the conditions of the environment on the other—the former ever attempting to adapt itself to these external conditions, but with varying success. When the intelligence of the organism does succeed in meeting the demands of its environment, and so adapting itself thereto—there is consequent "preservation" on the part of the environment; whenever it fails in this attempt, there is "destruction"

by the environment. In short, there is no reason whatever to assume that the activities of the organism must be fortuitous or mechanical if natural selection is to operate at all. Natural selection can operate just as well among "intelligent" as among "non-intelligent" forces. Natural selection, for example, can work and does work in the class-room among a group of youthful "intelligences" all struggling to meet the demands of the educational environment; and here, as elsewhere, only "the fittest" survive. Every competitive examination in school, college, or elsewhere, is an illustration. Moreover, to come to a yet clearer example, every athletic competition affords an illustration of the fact that it is not merely "brawn" (i. e. natural, physical powers), but "brain," or conscious, self-directed use of the physical endowments of Nature, that plays a most prominent part in forecasting the inevitable "selection." And when we further reflect that we are now coming more and more to realize that even these "physical traits" and "peculiarities" are themselves, as the products of heredity, the products of the operation of subconscious mind (for as we shall see, heredity itself is but a form of subconscious memory), we will begin to realize how universal is the operation of *mind* in Nature. And here we come to the meat of the whole discussion. Before we can appreciate the view that all evolution is an expression of mind, we must bring to the attention of our readers a number
mind, we must bring to the attention of our readers a number
the phenomena of conscious activity.

First of all, we know (as has already been pointed out in a previous chapter) that regardless of all prejudices and theories to the contrary, every shred of scientific evidence confirms the view that living protoplasm itself is the *product* of life. That is to say, we have direct evidence, in the case of the plant, that already existent life takes the physical energy of sunlight, and the chemical energies stored up in CO_2, H_2O, and NH_3, and by simultaneously combining them, and infusing its own characteristic energy into the synthesis, produces new living protoplasm before our very eyes; and as no other method of manufacturing protoplasm has ever been observed—that is to say, no method that would eliminate already existent life as the essential condition of the process—it is obvious that this, and this *alone*, is the only scientific explanation that we have of the matter. Indeed, there is but one other instance in nature, where we can actually observe the creation of new living protoplasm going on, *viz*: in the body of the animal organism, and here again it is the already existent vital principle that takes the non-living organic material (vegetable and animal food) and transmutes it into living material. The dead organism cannot accomplish the feat, even though all the other factors be present, thus proving again that it is the pre-existence of the life factor that is the *sine qua non* of the whole process. With such indisputable facts staring us in the face, it is difficult to understand how any unprejudiced mind could arrive at any other conclusion. Indeed, it is quite safe to say that were it not for the persistent desire to prove the truth of the abiogenesis doctrine—a theory to which the extreme, materialistic school of Evolutionists is wedded—there never would have been any difficulty in accepting the biogenetic explanation, as it is clearly in line with all the facts observed in nature. Nor, indeed, has there ever been any good reason for questioning the probability that life itself is a primal form of energy; for though we may seriously question the particular hypotheses of Richter, Helmholtz, and Kelvin concerning the mode of its transmission to this planet, and even a number of other theories respecting the manner of its first appearance here on earth, yet we are fully in accord with the general statement of Helmholtz that we may seriously question "whether after all life has ever arisen, whether it may not be even as old as matter" itself. Moreover, from this point of view, there is nothing more unusual involved in the idea of such life "incarnating" itself in the elements of inorganic matter (as living protoplasm) than there is in the familiar spectacle of electrical energy "incarnating" itself, so to speak, in a mass of iron filings. In short, we believe that *already existent* life-energy (plant life) transforms the physical and chemical energies of its environment into new living protoplasm, in precisely the same manner that already existent magnetic energy, latent in a bar of steel, transforms a mass of ordinary soft iron into a new magnet. In a word, life "*vitalizes*" inorganic elements just as electricity "*magnetizes*" iron. There is no more difficulty connected with the one conception than there is with the other.

Again, since the essential characteristic of *living* (as distinguished from *dead*) protoplasm is its "irritability" or "sensitiveness" to stimuli, which irritability is not only manifested in all manner of rational adaptations and responses, but—as known to us in personal experience—is manifested as "sensation"—*i. e.* a genuine feeling, or state of consciousness—we have no good reason to doubt but that this life itself is sentient.* It has been shown by Fechner, Nägeli, Haberlandt, R. France, Binet and others that all the lowly activities of plant, or aneuronic life, are "psychical" in character, and we have such high authority as Wundt and Ziehen for the further statement that "all psychic action is conscious," at least *in origin*, which, after all, is the only point with which we are seriously concerned. It is this position, too, which Prof. E. D. Cope has taken in his celebrated theory of *Archaesthetism*. "Archaesthetism. . .maintains that consciousness as well as life preceded organism, and has been the *primum mobile* in the creation of organic structure." He maintains that "it is possible to show that the true definition of life is energy directed by sensibility, or by a mechanism which has originated under the direction of sensibility," and that "if this be true, the two statements that life has preceded organism, and that consciousness has preceded organism are coequal expressions."§ I heartily agree with this view, as well as with the further statements that "consciousness was coincident with the dawn of life," and that primordial conscious effort exerted in response to environmental stimulus, has not only been the cause of the formation of protoplasmic material *per se*, but, of the consequent distribution, arrangement, or organization of this material in organic structure, as well as the cause of all those sub-conscious, auto-

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*As Cabanis affirmed years ago—"to live is to *feel*." So also Prof. Cope declares that "the true definition of life is, energy directed by *sensibility*."

§*Primary Factors of Organic Evolution*, p. 513.

matic, reflex and organic activities likewise characteristic of living organisms. In short, I fully agree with the view that energy at origin is conscious, but that conscious acts often repeated tend to become unconscious, automatic, reflex, organic, and mechanical. To quote again—"Movements of organic beings on frequent repetition become automatic, reflex, and finally, as it is termed, organic. This means the running down of energy through various grades, beginning with *the highest or conscious stage*, and ending with the purely reflex, which is as unconscious of changes in the environment as is any one of the physical energies. The conscious stage is evidently the most susceptible to the stimuli of the environment, and the process of catagenesis is one of degeneracy to less and less sensitive and to more and more mechanical conditions. The resemblance of the lowest grade of organic activities to physical, mechanical energy is so great that it is almost universally supposed by Evolutionists to be of purely mechanical origin, but I have endeavored to show that they are of totally different origin, and that the only explanation of their characteristics is the hypothesis of catagenesis."* If this principle be true (which we certainly believe to be the case) its obvious implication in the general domain of cosmic development is that *all* energy has had its origin in a conscious will (the divine mind), and that *matter, per se*, being as Einstein and the modern school of physicists have recently shown, but a manifestation of energy, is but the objectification of such Divine Conscious Will—in short, that the entire material universe is but the creation of an *Eternal Mind.*§ But let us not further anticipate these ultimate consequences of the theory.

We are now in a position to consider the second stage of the argument more particularly—*viz*: that not only organic matter itself, but its distribution, organization and structural arrangement are all *the product of sentient life.* It is not only Cope who maintains this view. It was the emphatic declaration of Herbert Spencer. "Does life produce organization, or does organization produce life?" is the clear cut question which he proposes for consideration, and in answer thereto, makes the following statement: "It may be argued that on the hypothesis of Evolution, life necessarily comes before organization. On this hypothesis, organic matter in a state of homogeneous aggregation, must precede organic matter in a state of heterogeneous aggregation. But since the passing from a structureless state to a structured state, is itself a vital process, it follows that vital activity must have existed while there was as yet no structure: structure could not else arise. That function takes precedence of structure, seems also implied in the definition of life. . .Function is from beginning to end the determining cause of structure."* Even Prof. Huxley expressed the same opinion. "Huxley, more cautious than Haeckel," declares Joseph Cook, "says that life is the cause of organization, and not organization the cause of life. He has printed that opinion over and over (Huxley, *Introduction to the Classification of Animals*), and has never taken it back. Well, if life is the *cause* of organization, probably it is safe to say that the cause must exist before the effect. At least that is Nature's logic."**

**Id.* pp. 510, 511.

§For the further elaboration of the view see the author's work—*Idealism and the New Physics.*

It is needless to add that both of these writers, in turn, were only reaffirming a view which is implicit in the theory of Lamarck.§ After all, therefore, there is nothing new or strange in such an interpretation, and we are here only emphasizing an opinion which, however ignored for obvious reasons, has the highest scientific authority behind it, and is plainly in harmony with all the facts known to biologists. The "obvious reasons" here referred to are, of course, the wholly uncalled for fears, on the part of biologists, that the recognition of such metaphysical agencies as sentient life or conscious will as the "causes" of *matter per se*, as well as of all material organization and development, would be an "unscientific procedure," as though the recognition of any facts of direct mental experience (whether physical or meta-physical, material or im-material data), or any conclusion derived therefrom by the processes of reason and logic, could be rationally designated "unscientific". What the average specialist in physical science has yet to learn, is that "the facts of human experience" upon which all science must necessarily rest for support, are not only far broader than the particular group of phenomena comprehended within the limited sphere of his particular speciality, but are further, in their very nature, *mental* experiences. Truly great scientists, like Prof. Huxley,—despite their natural prejudices—have freely conceded this point,* while to equally astute thinkers and reasoners in the domain of philosophical Idealism, it has long been as clear as day that simply because all human experience is necessarily *mental* experience, every datum of such experience, whether designated a "physical" or a "meta-physical" entity, is, of necessity, an entity *born and framed in consciousness*—such consciousness being self-evidently, the very ground and condition of its "existence".

**Principles of Biology*, Vol. I., p. 153; p. 167.

***Boston Monday Lectures*, p. 90.

§Lamarck's "Second Law" which is as follows: "The production of a new organ or part results from a new need or want, which continues to be felt, and from the new movement which this need initiates and causes to continue. (This is the psychical factor in his theory, which Cope later has termed *Archaesthetism*.)" Osborn, *From the Greeks to Darwin*, p. 166.

But, while from the standpoint of the idealist it is little more than a truism to assert that matter, motion, and mechanism, are all translatable into terms of consciousness—(being merely names which we give to certain of our mental experiences) and while even so eminent an authority in physical science as Prof. Huxley stated many years ago, in no uncertain language, that matter, motion, extension, force, and "existence" itself, are "*known to us only as forms of consciousness*"—that their very "*being is to be conceived or known,*" and that, furthermore, "*the existence of a state of consciousness apart from a thinking mind, is a contradiction in terms*"§—it is nevertheless taking many of our physical scientists a long time to appreciate the significance of these admissions, and to realize how completely their older materialistic conception of the universe has been undermined. The epoch making discoveries in the sphere of chemistry and physics which have taken place in the past few decades, together with the yet more recent physico-mathematical theories of Minkowski, Einstein, Jeans, Eddington and others, have indeed revolutionized the attitude of the leading physicists of the world, on this point, and as Viscount Haldane has pointed out, it is no longer possible even for physics to dispute this basic principle of Idealism, *viz*: that "relation to mind is essential to Nature, which would not be Nature apart from this relation." But while this obvious and indisputable fact, is receiving the somewhat reluctant recognition of the physicists, its implications in the realm of biology are still persistently ignored. Here it continues to be the fashion to ridicule every suggestion of a "vital principle" or a "psychoid factor" in the delusive hope of some day explaining life and mind in terms of matter and mechanism;—as though these phenomena themselves were anything more than "forms" or "data" of that very consciousness which they are called upon to "explain". But illogical and even incredible as such an attempt appears to us, we will not pursue its criticism further in this connection, but will proceed at once to consider the problem from the general point of view of the biologist.

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*See quotation on title page of this book.

§"Berkeley on Met. of Sensation" (*Critiques and Addresses, especially* p. 314.) Also see "On Descartes' Discourse" (*Lay Sermons*, pp. 320-344).

We have heard much, indeed, of the attempt to explain the mind and intelligent acts of animals in terms of neuro-muscular mechanisms, automatic responses, reflexes, and other mechanical reactions to stimuli. We have seen that the principle has been applied to the various "tropisms" of plants and other aneuronic organisms, while even the fundamental properties of living matter are now subjected to experimental observation in the laboratory in the hope that these also may ultimately be explained in terms of chemical and physical reactions. It is unnecessary to say that nothing of importance has ever resulted from these investigations, while the possibilities involved in the reverse hypothesis—*i. e.* that mechanism may itself be the effect, rather than the *cause* of life and consciousness—though repeatedly urged by older investigators, and most ably advocated by Beale, Cope, Reinke, Driesch, and Wolff, has been discretely ignored. Who does not know, for example, that conscious acts, frequently repeated, tend ever to become subconscious, automatic, and mechanical. The precise manner in which this "degradation" of conscious energy is to be explained may be, indeed, a matter of dispute; and it may also be true that the science of neurology has gone a long way since M. Jules Soury, of the Sorbonne, made his ingenious suggestion that nervous and electric processes might be analogous—the sub-conscious, automatic processes of the one, being likened to the silent flow of the electric current through a closed circuit—while consciousness itself might be compared to the light of the electric spark leaping the gap in a broken circuit; but there is, nevertheless, a valuable hint underlying the suggestion. Nor is there any reason to assume that the hypothesis lends itself necessarily to a materialistic rather than an idealistic interpretation. We have only to apply the fundamental principle of Idealism to the problem, as Cope has so beautifully done in his theory of Archaesthetism; we have only to acknowledge with him the self-evident fact that "the preliminary to any animal movement which is not automatic, is an effort. . .(that) as no adaptive movement is automatic the first time it is performed, we may regard effort as the immediate source of all movement" and that this "effort is a conscious state and is a sense of resistance to be overcome;" we have only to remember, further that "when an act is performed without effort, resistance has been overcome, and the mechanism necessary for the performance of the act has been completed. The stage of automatism has been reached."* We have only to accept this beautiful explanation of how the nervous tracts and connections so necessary for the automatic cerebration and sub-conscious activities of the brain are thus directly created and organized under the *conscious effort of the will,* and we have at once the key to one of the most mysterious problems of education—how the will itself builds up those organs of memory, speech, (Broca's) and other mechanisms, whose physical character—whether localized in specific centers or spread over large areas of the cortex—has been fully demonstrated in the pathological studies of the psychiatrist. Indeed, not only has it been clearly shown that

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**Primary Factors of Organic Evolution,* p. 498.

these mechanisms exist,—that they can be destroyed by disease or accident, and, under certain circumstances, even reconstructed by persistent efforts of the will, in the opposite hemisphere of the brain, but the same facts lead us beyond the limits of these specific organs to the recognition of the general truth that *all the intricate net-work of the cerebral structure has arisen in like manner, as the literal embodiment or incarnation of primordial conscious activity;* that even below the cortex the entire system of nerve centres and connections, through which the unconscious energy of all our automatic and subconscious processes flow in silent mechanism has so originated—nay more, that there is no reason to doubt that the entire structure of the nervous system has thus originated—is but the embodied memorial, handed down by heredity (which is itself only a form of memory—the racial or phylogenic memory) of the persistently repeated conscious acts of untold myriads of ancestral organisms. That "memory is a general property of organic matter," was asserted by Ewald Hering as far back as 1870, and it is well known that Haeckel, in his Essay on *The Perigenesis of the Plastidules* has built his theory of heredity thereon. The amazing thing, however, is that with all the emphasis which these two writers have placed upon this indisputable truth, they have made so little use of it; have failed utterly to realize that *memory itself is but a product of consciousness*—the "reproduction" of a former conscious state or its "movement" in embodied form, *i. e.*, literally "incarnated" in some "property of organic matter;" and that, as a result of this principle, it will be found that all sub-conscious, automatic, or unconscious acts have so originated; and that—carrying out the principle to its ultimate philosophical consequences—we must be prepared to receive the final discovery that all mechanism is but "the reflex of intelligent agency"—so that the physical universe itself—the entire system of unconscious matter, motion, and mechanism—is seen, in the last analysis, to be but the reflex of the conscious will and intelligence of God.

This spectacle of the conscious principle ever incarnating its activities in organic matter from above downward, as it ceaselessly builds up this great physical memorial of its experimental activities, layer by layer, from cortical to sub-cortical mechanisms in the cerebral hemispheres, is strikingly analogous to the process by which unnumbered generations of coral polyps have left the memorial of their life activities embodied in the solid rock of the coral reef that now stretches hundreds of feet below their living descendants. This living portion of the reef is also, like the conscious portion of the brain, the merest veneer or "cortex" spread over the vast monument of stone which has been erected to the memory of former generations, and is further testimony to the fact that sentient life can "deposit" the memorial of its conscious activities even in the inorganic material of the solid rock, as well as weave its story in the organic structure of a brain. Nay more, we have only to reflect somewhat more deeply on the subject to realize that there are many other analogies that strongly suggest that with the same methods by which the geologist and the palaeontologist study the successive "strata" of the earth to discover, by means of the fossils there embedded, the history of the past life upon this planet, and the processes by which the present races have come into existence, the physiological psychologist may well study the sub-cortical structure of the brain, to say nothing of the entire mechanism of the nervous system, to discover by means of every ganglion and fibre there incorporated, the psychological acts and processes of the myriad "minds" and "orders of minds" that have preceded the present race of human beings. As Agassiz profoundly remarked, "the crust of the earth is a great cemetery, where the rocks are the tombstones on which the buried dead have written their own epitaphs," so we may add, aye, but more—the rocks themselves are the product of their labours—and there is evidence that all matter, whether organic or inorganic, must sooner or later be discovered to have had its origin in sentient life.

In presenting this explanation of the origin of nervous mechanism out of conscious effort, then, it must not be inferred that the principle is limited in operation to the cerebro-spinal system. On the contrary, wherever automatic and reflex activities are observed—operating through the instrumentality of *any* kind of nervous mechanism—as is the case even in the so-called sympathetic system—we must apply the principle. "In accordance with this view," declares Prof. Cope, "the automatic 'involuntary' movements of the heart, intestines, reproductive systems, *etc.*, were organized in primitive and simple animals in successive states of consciousness, which stimulated 'voluntary' movements, which ultimately became rhythmic; whose results varied with the machinery already existing and the material at hand for use." But it must be remembered that these, to say nothing of numberless other kindred "mechanisms," are the product of the conscious activities of *primitive and simple animals*—that is to say, of organisms which existed in the remote geological past, and are not, of course, to be regarded as of human origin.

In short, it must not be supposed that in making this statement, we mean to imply that all the matter and mechanism of the nervous system in man have originated as the result of the self-conscious mind, and that man has been the creator of it all. Indeed, it is only a very small portion of the entire mass of nervous material that can be attributed to the activity of the strictly *human* mind, for it is only the phronetic cells and cell-mechanisms (fibres of association, *etc.*), of the cerebrum, together with their immediate sub-cortical centres and connections, that have come into existence within the human period (and to a large extent within the historic period) as the result of the repeated self-determined efforts of the human will. By far the greater portion of the nervous system (to say nothing of other structures) even in man, originated in the far geological past, as the product of the conscious activities of much lower organisms.

The significance of this statement—which, after all is only an aspect of Haeckel's law that "Ontogeny is a brief recapitulation of Phylogeny"—will readily be appreciated from what has already been pointed out in regard to the three distinct systems—aneuronic, neuronic, and phronetic—which together unite to form the unity of man's constitution. These three distinct systems must be interpreted as representative of the three phylogenetic stages which have occurred in the past history of organic evolution. In short, each individual human being "recapitulates" in the course of his ontogeny the "vegetal" (aneuronic) as well as the "animal" (neuronic) stages, before entering upon the highest "human"—(phronetic) stage peculiar to his type. This "recapitulation" is well defined in the embryological development of each human individual, as follows:—

(1) Aneuronic Stage:—From ovum through appearance of morula, blastula, and gastrula substages.

(2) Neuronic Stage:—From Triploblasticon on, with development of neural canal and concomitant metamerization of body, growth of spinal cord and its ramifications, hind-brain, mid-brain, fore-brain, and all the structural differentiations of bodily parts and organs which accompany the same, till the specific human type is attained.

These fundamental types thus recapitulated in the embryogeny of each individual are preserved as essential structural "systems" in the adult organism, and while each continues to "function" after the manner peculiar to itself, they nevertheless harmonize in perfect symbiotic unity within the higher, all-controlling "system" of the human personality. That is to say, these two intimately coordinated, but none the less distinct "systems" (aneuronic and neuronic) are now completely subordinated to a third—the distinctively human or phronetic system represented in those highest synthetic mechanisms of the cerebral hemispheres of man.

In short, there are three distinct "systems"—a human, an animal, and a vegetal—represented in the physiological structure of man, and each built up by its own characteristic type of mind, to wit:—the *aneuronic,* a construction of purely sentient mind; the *neuronic,* a construction of percipient mind; and the *phronetic,* a construction of self-conscious, self-determining mind. The particular type of mind, characteristic of each of these systems, therefore, is incorporated as a potential within the human system, and is responsible for the construction of those particular portions of the organic material and its organization that have ever been distinctive of the activity of that specific type. Thus, the purely sentient or vegetal mind is responsible for the creation of new protoplasmic material as such, the processes of metabolism, assimilation, growth, reproduction, cell-association, germ-layer formation, and all tissue growth and development in so far as it is uninfluenced by nervous energy proper. It is also responsible for all protoplasmic "irritability" and response to stimuli, and especially for those reactions and adaptations to environmental energy which are spoken of as *tropisms.* It is especially to be noted however that while the sentient mind is capable of a genuinely rational response to environmental stimuli of this order, it has no capacity for response or adaptation to any environmental influences *above the level of these lowest Sense experiences*—cannot (self-evidently) adjust itself to any condition revealed through perceptual experience alone; and so oftentimes, from our higher viewpoint which embraces not only perceptual but even conceptual experience, appears, superficially, to act blindly, irrationally and mechanically to such environment, as we see it. In like manner, the percipient *anima*—the truly animal mind, though reacting to much higher influences than the former, and always in a rational manner, is nevertheless limited in all these responses and adaptations, to its own well defined sphere of perceptual experiences—*i. e.* the experiences of sense-perception. Thus, the animal mind has nothing to do with the manufacture of protoplasm, or with the inauguration of the fundamental processes of assimilation, nutrition, growth, *etc.,* but takes this protoplasmic material as furnished and already organized into cells, germ-layers, and other structures, by the sentient vegetal mind, and converts it to its own higher purposes. In short the animal *invades the vegetal system from without*—takes up its abode therein, and proceeds to graft upon the purely aneuronic mass, a further neuronic system of its own, and having spread its numberless nerve fibres and ramifications throughout the whole, metamorphoses the entire structure into an altogether new system — a neuro-muscular individuality. In a word, the sentient and the percipient mind, the vegetal and the animal life, have entered upon a symbiotic union, in which the latter controls, dominates and directs, but does not actually destroy the former, which still continues to *live* and *feel* and *act* for itself and while constantly supporting and serving the ends of its master, it is, in turn, cared for and protected by the greater intelligence of the latter.* This anima, soul, or animal mind then is primarily responsible for the upbuilding of the entire nervous mechanism, (exclusive of the highest phronetic centres,) and coordinated "neuro-muscular" apparatus, specialized sense-organs, *etc.*, and all the functional activities which result as a consequence therefrom. Moreover, just as the specific pattern of the vegetal organism is the product of the rational reaction of sentient mind to those influences of the environment which it is able to experience, so is the pattern of the later animal organism the product of the rational reaction of the percipient mind to those yet higher influences of the environment which its greater intelligence enables it to experience.

Finally, the human spirit in turn "invades" the animal system thus formed (even as the latter had formerly "invaded" the vegetal system)—enters into a symbiotic union therewith, and proceeds to construct or graft upon the nervous system of the animal, in turn, its own distinctive phronetic mechanisms —the thought, speech, writing centres and connections, peculiar to the brain of man.

The substance of our conception, then, may be summed up in the statement that man is literally an "organism of organisms." That comprehended within what is called the human system are two subordinate systems—(1) a vegetal or aneuronic system—consisting of numberless cell-individuals ("Cytopsyches")—Haeckel, and (2) an animal or neuronic system—consisting of as many "Ganglion-individuals ("Gangliopsyches")—both living under the control of the higher (3) human or phronetic system.[§] Moreover, because each of these systems is, as the name implies, a true "unity" or "individuality," though each, in turn, represents a different plane or order of being, in which the first is subordinate to the second, and the second to the third, they represent in the case of man, an *hier-*

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*See note at end of chapter.

[§] After all, what we are here stressing in more modern scientific phraseology is nothing more than the view of Aristotle that man is a tri-unity of a "vegetative", an "appetitive" and a "rational" soul.

archical system—a *tri-unity* of psychical potentialities (*viz*: sentiency, percipiency, and self-conscious concipiency and volition), which has long been recognized theologically under the familiar distinctions of body, soul (mind) and spirit. Though involved in much obscurity, this truth has also long been recognized, in one way or another, both by psychologists and physiologists. It is these "subordinate individuals" far beyond or below the threshold of the distinctively human consciousness which not only sustain the fundamental life processes of metabolism, assimilation, growth, reproduction, *etc.*, together with numberless reflexes, automatisms, spontaneous reactions, adaptations, and adjustments to environing influences, but which, in the higher neuronic centres appear actually as sub-conscious "intelligences", and which constitute those marvellous "powers" of the sub-conscious mind of man which are at once the wonder and bewilderment of psychologists to-day. Under the control of the self-conscious ego they prove to be veritable fountains of inspiration which the genius of the latter employs to accomplish his own wonderful intellectual creations, but which, when for any reason they become emancipated from the control of the master, become the dangerous "urges," "complexes" and "obsessions" of the psychoanalyst, and which are again, in turn, nothing more or less than the "evil" or "unclean spirits," "demons", or "devils" of the ancients. But while these subconscious "intelligences" which thus operate independently of the consciousness of the human ego, may thus break loose in rebellion, from time to time,—may even enslave the will, hypnotize, obsess and (deranging the reason,) actually produce insanity—yet, normally, they are under the control of the will, and in this state of subjugation become (as just stated) beneficent sources of intellectual power and inspiration.

In conclusion, then we note *three distinct* ORDERS OF MIND in nature—*viz*: sentient, percipient, and self-conscious, self-determining and concipient mind, which actualizing and embodying their potentials "in the flesh" give rise to as many distinct BIOLOGICAL TYPES—*e. g.* Aneurobia, Neurobia, and

Phronetobia. Their chief functions and characteristics are tabulated below:—

SUMMARY OF ARGUMENT

EMERGENCES

Psychological	**Biological**
(I) **FEELING (Sensation)**	Sentient Organisms *Aneurobia..* *Organisms devoid of any kind of centralized nervous mechanism; capable of experiencing feelings (*e. g.* "organic sensations") but without "cognition" or "mind" proper. Comprises the unicellular organisms generally, together with Metaphyta (plants) and Zoophytes (plant-animals). The diploblastic Coelomata. Aneurobic sentiency represents the primitive consciousness —the *Archaesthetism* of Cope.
(II) **PERCEPTION (Sense-Perception)**	Percipient Organisms *Neurobia.*** Organisms possessing some kind of centralized nervous mechanism, sense organs, "neuro-muscular apparatus"; capable of experiencing spatial relations and spatially conditioned "objects" (percepts). Includes all the triploblastic Metazoa (Coelomata) below man.
(III) **SELF-CONSCIOUS CONCEPTION**	Concipient Organisms *Phronetobia.*§ Organisms possessing "thought centres" or "mechanisms" in cerebrum (*e. g.* "Broca's Mechanism")—capable of forming ideas, concepts, *etc.* Also endowed with self-consciousness and consequent self-determination (*i. e.* volition.) Includes man only.

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*Greek—α—without; νευϱον—a nerve; and Βιοϛ—life. Organisms without nerves.

**Greek—νευϱον—a nerve; Βιοϛ—life; Organisms possessing a nervous system.

§Greek—φϱονεω—to think or purpose; and Βιοϛ—life. Organisms capable of thinking and purposing (volition), which possess "phroneta"—"thought cells" (Haeckel) or "centres" in the cerebrum.

(1) The conscious principle involved in simple feeling (sentiency) is what is commonly called *"life"*—*i. e.* the *"vital principle"*. "To live is to feel."

(2) The conscious principle, or agent, involved in perception is the *"anima"* or the *"attention"*; what is commonly called the *"soul"*—the attentive subject.

(3) The conscious principle, or agent, involved in ideation, conception, or representation is the *self-conscious, self-determining spirit, will, ego;* (*person*).

(1) The aneuronic plant (as also the zoophyte) "feels" but "knows not" (*i. e.* "notices not"—does not "attend to" his feelings. Has no power of "cognizing" or "interpreting" his sensations).

(2) The neuronic animal both "feels" and "knows" (*i. e.* "notices" or "attends to" his sensations, interpreting them in perceptual experiences—as definite spatial "objects" and "relations",) but "knows not that he knows."

(3) Phronetic man "feels", "knows" and "knows that he knows" (*i. e.* he can even "attend to" his "attention," forming "representations" of its activities, "concepts," *etc.*

Again,

(1) *The sentient mind* constructs living protoplasm out of nonliving chemical and physical energies*; differentiates it into cells, germ layers, tissues, and all other aneuronic structures and organs, and is consequently responsible for growth, reproduction, and all those "vegetative" functions and activities (including the "tropisms" and other reactions to environing impulses) *not connected with a nervous mechanism of any kind.*

(2) *The percipient mind* constructs the entire nervous system (exclusive of the highest thought and speech centres of the cerebral hemispheres) and the coordinated neuro-muscular apparatus out of the material furnished it by the sentient mind, and is correspondingly responsible for all those neuro-muscular activities, responses, reactions, adaptations and adjustments to surrounding conditions, carried on through the instrumentality of this mechanism.

(3) *The self-conscious, self-determining, concipient* mind constructs the thought, speech, writing, and other phronetic mechanisms, with their interconnecting "association fibres" out of the nervous

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*It will be remembered that we have direct evidence of plant life manufacturing protoplasm out of CO_2, H_2O, and NH_3 and sunlight. In every act of food assimilation in the animal kingdom also, we have the spectacle of living protoplasm being manufactured by the living agent of the organism out of non-living organic matter.

material furnished it by the percipient (neuronic) mind, and in operating through this phronetic mechanism is correspondingly responsible for all those higher conceptual and creative activities characteristic of the human (as distinct from the animal) mind, as well as for all those voluntary responses, adaptations, *etc.,* to environing conditions, carried out through the processes of conception and ratiocination.

But while all three of these *psychological types* are represented in nature under the corresponding *biological embodiments* enumerated above (*viz*: Aneurobia, Neurobia, Phronetobia) yet, with the exception of the first and lowest, each type is grafted upon, and so exists in symbiotic unity with, that below it. The *anima* or "soul" of the animal literally engrafts its nervous system upon the aneuronic body. In short the animal literally incarnates itself in the vegetal body in a true symbiosis. And, in like manner, the human spirit literally engrafts its phronetic mechanism upon the nervous system of the animal—incarnates itself in the animal body, and so enters upon a true symbiotic union with the animal and the vegetal life. Consequently, as we have already pointed out, there are three psychological and biological types represented in the human system—*viz*: the BODY, SOUL, *and* SPIRIT distinctions of theology. We may represent them specifically as follows:—

(1) BODY (σωμα)—the aneuronic, vegetal nature.

(2) SOUL (ψυχη)—the neuronic, animal nature (*i. e.* "anima"—soul).

(3) SPIRIT (νους)—the phronetic, human nature (*i. e.,* the ego, will.)

Before concluding, a word or two must be said regarding the relation of mind to reproduction. With certain qualifications, we agree with Ewald Hering in believing that "Memory is a general property of organic matter," as also with Haeckel in further maintaining that reproduction is nothing more or less than a form of memory. What we mean to say is that inasmuch as it can be proved (by what has already been pointed out) that *protoplasm itself,* as well as all its structural differentiations, is the product of conscious activity—nay, more; the very "incarnation" of such conscious activity; the energy thus "incarnated" possesses the potentiality, under stimulation, for "reproducing" (subconsciously) the formula of the original movement, and in this manner, the organic mechanism so formed becomes the material means by which the "memory," "recollection," or "reproduction" of the former conscious experience may be insured—in much the same way (to use a suggestive, but by no means really accurate illustration) that the material indentations on the disc of the phonograph—produced originally by the sound waves of the human voice—can be employed mechanically to "reproduce" this voice. In a word, the mechanism in the brain is the physical representative of the revived mental state (memory), in very much the same manner that the imprints in the disc, are the "physical representations" of the reproduced human voice. But the principle thus established is by no means confined to the mechanism of the brain, but, as we have seen, *extends to the whole somatic structure,* for the entire body is but the "memorial" of the conscious activities of the three orders of mind which combine to form the human individual—the conscious will or spirit producing the phronetic mechanisms in the cortex of the cerebral hemispheres; the *anima* or soul producing the rest of the nervous mechanism; while the sentient life produces the living matter *per se* (*i. e.* the protoplasm) and all its aneuronic differentiations (cells, cell-layers, tissues, *etc.*) But the effects of the principle are by no means limited to the somatic cells and cell-structures, thus described, but extend also to the germ plasm. That is to say, just as each of the above mentioned orders of mind thus stores up the record of the psychical experiences in the somatic material and structures which they severally weave, so also do they in their cooperative tri-unity —*i. e.* as a single organic system or individuality—store up their combined experiences in the structural mechanism of the germ plasm, which thus becomes the monumental record "in the flesh" of the psychical experiences of the race—passed on from generation to generation, but constantly receiving infinitesimally small increments from the individual experiences of each successive organism in the chain. That these constantly received "increments" to the racial store of embodied experiences, are not observable, need occasion no surprise whatever. We can no more expect to observe them than we can expect to observe the infinitesimally small increments of calcium carbonate which are successively added to the monumental stalagmite with each drop of water from the roof of the cave. It is only the accumulation of ages that appears to view. Doubtless there is much that remains obscure in this suggested explanation, but, in the main, we believe that there is no more reason to doubt that the marvellous potentialities of the germ plasm to "reproduce" the entire body of the adult organism, (along with all its characteristic reflexes, automatic, instinctive, and subconscious activities), is the product of the racial consciousness; than there is to doubt that the marvellous potentialities of the gray matter of the human brain to "reproduce" the significant speech, memories, and other experiences of the individual, is similarly, the product of man's own conscious efforts and volitions. In a word *conscious effort is both the creator and the organizer of matter*, and all the sub-conscious activities of the organism, including not only the instincts, automatic, and reflex activities, but the singular power latent in the brain to "reproduce" conscious experiences (memories) and even the most intricate rational processes;—all are the product of such psychic energy.

We affirm, then, that the marvellous capacity to "reproduce" an entirely new organism endowed, in turn, with all these potentialities, is to be explained, and can only be explained satisfactorily, upon this principle. As Haeckel truly says, "I do not see still how heredity can be explained without this assumption. The very word, 'reproduction,' which is common to both processes, expresses the common character of psychic memory."* But if this interpretation be correct—if reproduction itself is thus to be explained as a kind of memory, and if the physical representative of memory in the brain can be

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**Wonders of Life*, p. 136.

shown to be a mechanism fashioned by the intelligent agency of the will in conscious effort, it is easy to see that we have here the key to the solution of a very important problem. *The mechanism of heredity (i. e. racial memory) is formed in the substance of the germ plasm, in precisely the same manner that the mechanism of individual memory is formed in the substance of the brain tissue, through the direct agency of conscious effort and volition.* It is simply a fact that mental effort "organizes" brain tissue and, through the mechanism so constructed, can "reproduce" at will (as we say) the original mental experience; and there is no good reason to doubt but that the mind "organizes" the germ plasm in like manner, and through the instrumentality of this germinal mechanism (the genotype or "system" of genes)—"reproduces" (in the ontogeny of the individual) an epitome of the racial experience (phylogenic memory). The manner in which this marvellous "incarnation" of psychic energy is effected, and especially the mechanism through and by means of which certain experiences, registered as "memories" in the brain can be (if so they are) transmitted to the germplasm in the reproductive cells, are matters which we shall have to consider presently. Suffice it to say that much light has been recently thrown on this subject by the amazing role which the endocrine glands are known to play as intermediaries between conscious experiences and their physical "representatives" in the germ cells.

NOTE A.

It is significant that "symbiosis" is probably more common between animals and plants than among animals."* For example, "Certain sea anemones possess unicellular algae imbedded in the cells of the endoderm."** There are also certain Radiolarians which have "yellow cells" scattered through their protoplasm, and the latter are known to be "unicellular plants, for which the term *Zooxanthellae* has been proposed. . . .the coexistence constituting an example of the phenomenon known as symbiosis."§ Also the dark green color of *Hydra*

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*Galloway and Welch, *Zoology*, pp. 125, 126.

***Id.* p. 126.

§McMurrick, *Invertebrate Morphology*, p. 20.

viridis has been traced to certain "chlorophyll-containing corpuscles imbedded in the ectoderm cells and supposed by some authors to be unicellular algae of a symbiotic habit."* There is nothing exceptional, therefore, in the supposition that the animal or neuronic system may have been engrafted, as it were, upon the vegetal or aneuronic system in a symbiotic union, and that, in the course of time, the two systems have, in turn, been assimilated, as opposite poles in the integral of a self-conscious organism:—the human spirit, incarnating itself in the animal nature in precisely the same manner that the animal soul had formerly incarnated itself in the vegetal nature, and as this vegetal life, in turn, had at the beginning incarnated itself in non-living inorganic matter.

NOTE B.

The truth underlying the intimate relation of mind to mechanism is universally admitted, even by those whose explanations of the matter are diametrically in conflict. Thus while materialistic psychologists, like Watson, would explain every mental experience as the product of a corresponding physical mechanism, so the psychotherapists would explain every mechanical movement or reflex activity of the body as theoretically the expression of a mental state, and would, correspondingly, seek to correct all functional disorders by applying the psychical stimulus of an hypnotic suggestion. Now, whatever the practical difficulties of this method may be, on account of the diverse orders of mind that must be reached and influenced through "suggestion" delivered from the higher centres of consciousness, it is nevertheless certain that *in principle* this view is correct. As already pointed out, we have every reason for believing that in the ultimate analysis of the matter, every mechanism can be shown to have originated as the product of *conscious activity,* but as these activities proceed from conscious agents or "intelligence" of very diverse orders (for human personality is an integral of subordinate intelligences), it does not follow that these lower agencies can be readily or easily influenced (in every instance) by the governing ego. In short, we believe with Mr. Syme, "that each psychical centre has a consciousness of its own, and that this consciousness is related to the supreme consciousness (the ego) as the subordinate nerve centres are related to the supreme nerve centres (the cerebral hemispheres)".§ Moreover, we further believe that the repair and partial reconstruction of these nervous centres and mechanisms which is going on all the time, is the product of the conscious activity of these intelligences, just as, phylogenetically, these same "centres" and "mechanisms" originated from the conscious activities of their remote geological ancestors. In conclusion,

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**Id.* p. 83.

§*The Soul,* p. 73.

then, I would say that I agree with Watson as to the great importance of stressing the study of the physiological mechanism in all our attempts to build up a true scientific psychology; but, I disagree with him in his denial of the equal importance of introspection, and the application of further subjective methods as well; just as I disagree generally with all attempts of materialism to interpret the Cosmos solely in terms of mechanism. All such attempts are, necessarily, unscientific and futile, in as much as they deal with *only one half the data of human experience.* It is just as preposterous as it is to advocate the application of inductive, to the exclusion of deductive reasoning; or the study of the environment only, to the exclusion of all study of the organism; or the study of the positive pole of the magnet to the utter neglect of the negative pole. Indeed, this last illustration is the more apt, inasmuch as reality, like the magnet, is *per se* a polarity (*i. e.* an unity of antithetical principles), and there is no more possibility of forming a true conception of reality by studying its mechanistic or material pole alone, than there would be in forming a true conception of the magnet, by considering a single pole only. Both must be studied *in their mutual relationship,* and in applying the principle here, it will be discovered that for every unit of matter there is a corresponding spiritual correlative; for every physical actuality, there is a corresponding meta-physical potentiality—for every quantum its negation, *i. e.* for every quantity its zero; or to put it yet more clearly, for every quantum of actual energy (*i. e. every quantum* of matter) there is a corresponding quantum of potential energy (*i. e.* immaterial spirit.) You can no more divorce immaterial conscious spirit from its product unconscious matter, than you can divorce potential energy from actual energy. It is because mechanism is itself a product of conscious activity that, as Watson rightly urges, it should be studied to understand conscious activity; just as it is right to study the dramas of Shakespeare to understand the mind of Shakespeare. Matter, as aforesaid, is the self-objectification of consciousness, even as Mechanism is the further objectification of its mode of movement, and because both are thus the creations of consciousness, they depend upon consciousness for their very being or existence. And that this reduction of both matter and mechanism to mere "forms" of consciousness is indisputable, is easily demonstrated from the self-evident fact that all that the words "matter" and "mechanism" mean, or "refer to" are only certain experiences of our minds—that is, certain mental data, nothing more. While, therefore, we can always explain matter and mechanism in terms of consciousness (since data of consciousness alone are signified by these expressions), we cannot reverse the process and explain consciousness in terms of these. In short, consciousness is the lowest denomination, to which all the data of experience ultimately reduce;—*ergo* CONSCIOUSNESS IS REALITY.

CHAPTER XII

Memory the Basis of Heredity

FROM the facts presented in the foregoing pages, it will now be readily understood that a great change of opinion has taken place since the days of Darwin respecting the exact nature of the developmental process. "What we actually know about Evolution," says Prof. Patrick, "is that there is a step by step progress from the lowest to the highest forms of life. We assume that it is a process of continuity, but what we actually see and know is not a process of continuity at all, nor even a process of growth; it is rather the successive appearance of new forms and functions. It seems more as if the new were builded on to the old, than as if the new were growing out of the old. If the new grows out of the old, as the word Evolution would indeed strictly indicate, we should have to think of it as already potentially present in the old. . . .But," he continues, "Evolution does not seem like a process of unfoldment; it seems like a movement in the creation of new values."* With the one proviso that within each of the cycles which successively "emerge" to form the general process of cosmic development, "unfoldment" or "Evolution" is a fact, we should have little to criticize in the above statement. Evolution obtains within each cycle; *but the cycles themselves do not "evolve" one out of another, but rather seem to be built one upon another. .In short, as* stated at the very outset of this work, the author fully recognizes the fact of Evolution in Nature, but contends that the particular process with which the biologist is especially concerned has its "limits";—that it is, in fact, only a subordinate phase of a far greater, world-wide movement in which both Creation and Evolution have a rational place. That cosmic development is, in fact, an alternation of integrations and differentiations, of

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**Introduction to Philosophy*, p. 133.

creations and evolutions, with a definite goal foreshadowed. The principle of the "variable and its limit" is shown to be operative everywhere in nature. Now so important is this conception of the Cosmic Process in its bearing upon certain problems which we have yet to consider that, at the risk of some repetition, we here recapitulate its main stages.

There are at least four systems of energy operating Nature, and, with the exception of the first—the system of physico-chemical energy—each of the remaining originate from, and is the expression of, a specific psychological type or "order of mind"—to wit: *sentient mind* (vital energy—life;) *percipient mind* (psychic energy, soul, anima); and *self-conscious concipient mind* (self-conscious will, nous).

The character of each of these developments (evolutions) may be still further understood by an examination of the following:—

1. The evolution of matter per se (*i. e.* the evolution of non-living inorganic physico-chemical energy); as manifest in the development of worlds and systems out of primitive nebulae.

2. The evolution of living matter (aneuronic)—*e. g.* the evolution of protoplasm as such, together with its further aneuronic structural differentiation and growth. Comprises the evolution of plants and plant-animals (zoophytes). Acoelomata. "Vegetative evolution." Evolution initiated by *sensations* only.

3. The evolution of animal mind, anima, soul (neuronic)—Psychical evolution manifesting itself as instinctive, involuntary intelligence—Aristotle's νους παϑητιϰος *or passive reason.* The evolution of all organisms below man which possess a centralized nervous system. Comprises the neuronic coelomata. All the higher animals. Evolution initiated by perception, memory and emotional urges.

4. The evolution of human mind or nous (phronetic)—Psychical evolution as voluntary, self determined, intellectual and moral activity; evolution carried on by the will under the

"motivation" of ideas and ideals. Aristotle's νους ποιητιϰος or *active reason.* Comprises individual and social evolution—science, philosophy, religion, art, civilization. Evolution initiated by "motives"—*i. e.* ideas and ideals.

That these are no arbitrary distinctions which we have invented is witnessed by the fact that, when not influenced by preconceived theories and over-technical considerations, the common sense of mankind has always recognized them, and will always recognize them, under the popular distinctions of mineral, plant, animal, and man. Such clear-cut, and universally recognized distinctions cannot be ignored or minimized as unimportant, and the fact that all attempts to reduce the energies operating in the last three of these departments to a common origin in the first, or to account for their respective formulas of developmental movement—their distinctively orthogenetic evolutions—as simple mechanical resultants of principles latent in the first, have ever ended in hopeless controversy, is a circumstance too significant to be brushed aside. As we have clearly pointed out in the foregoing chapters, there is not a single instance of life or mind being produced by any combination of physico-chemical energies, although there is abundant evidence of *already existent* life creating new living material (protoplasm) out of these non-living energies, and likewise of *already existent* mind endowing such living matter, in turn, with its own specialized organs of activity—complex nervous mechanisms—through which it proceeds not merely to exercise complete control over the purely vegetal organism, but to carry on its own peculiar rational and intelligent activities, and effect its own characteristic ends and purposes.

Moreover, these organizing agencies, and the consequent rationally ordered, progressive movements toward specific goals which they inaugurate, and which we are accustomed to speak of as organic "developments" or "evolutions," are as well-defined energies and movements of nature, as any thing observed in the purely material realm of physico-chemical forces which they govern and utilize. They are not figments of the imagination, or the creations of visionaries, as near-sighted materialists too often maintain. The higher intellectual "movements" which we speak of as the "evolutions" of society, government, religion, law, philosophy, science, are as distinctly manifestations of force or energy as are the corresponding "evolutions" of plants and animals, suns and planets.

Not only then do we maintain that this conclusion is the only one that is warranted from a consideration of the facts mentioned, but it is a conclusion which is being further confirmed every day by a study of the specific phenomena presented by living and intelligent organisms. As expressed by a recent biologist, who is far from being a vitalist himself, "many physiologists have felt compelled to appeal to something different from the ordinary forces of nature in order to account for the constructive and coordinating processes of life. It has been asserted that natural forces, left to their own guidance, are capable only of destruction. When life leaves the body, things fall into ruin and decay. Life apparently has to struggle against these forces of nature. Claude Bernard, one of the greatest of physiologists, declared that 'vital phenomena have their physico-chemical conditions rigorously determined,' but at the same time the organism 'appears to be directed by some invisible guide in the course which it follows. . .The vital force directs the phenomena, which it does not create; physico-chemical agents produce phenomena which they do not direct.' Bernard, like later vitalists, is desirous of adopting an interpretation of control which does not get him into trouble with the doctrine of the Conservation of Energy. But can energy be controlled and directed by anything which is not a source of energy in itself? On this question there is no end of subtle discussion. The captain, in controlling the course of his ship, may use relatively little energy, but he must use some."* The answer to this objection is that the Law of the Conservation of Energy applies only to energy operating *within a closed system.* The closed system, in this instance, is the system of physico-chemical energies—the system of material forces. The whole point of our argument, however, consists in the assumption that

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*S. J. Holmes, *General Biology,* pp. 13, 14.

the energies (and there is no reason to deny them that title) of *life* and *mind* do not belong to this system, but are *transcendental* thereto. In short, we assume an hierarchical system of energies—*i. e.* diverse *orders* of energy—the energy operating on one plane utilizing the energies in the plane, or planes, below it to effect its peculiar ends or purposes. In this way, life and mind employ the lower forces of matter (chemical and physical energies), and while it is perfectly true that in the process of operating with these energies they differentiate or "cast off" no more of such energies than they integrate or "take up" —so preserving the balance of purely physical energies (as the Law of the Conservation of Energy affirms)—yet it is obvious that this indubitable fact in no way affects the statement that a living or intelligent agent, as the case may be, is present, presiding over this "intake" and "output" of physical energy, and utilizing the whole polarising process as a means whereby he may carry out his own peculiar purposes and designs. The point to be observed is not that the "intake" and "output" of mere physical energy continues always the same (which is irrelevant to the discussion) but the fact that during what we call the lifetime of the organism this "intake" and "output" of energy is employed by the organism to carry out *a higher cycle of phenomenal changes* (*viz*: growth, development, adaptive reactions to environment, instinctive, purposive, and rational activities directed to certain specific goals and ideals), and that once the organism dies, though the sum total of the physical energies given up by the dead body may yet be theoretically equivalent to the sum total of the energies absorbed *ab extra* during life yet the transformation ceases, and (what is still more significant) all the last mentioned higher activities (development, purposive, and rational activities, *etc.*) which were manifested through such transformation, come abruptly to an end. In short, it is this higher form of activity, which begins and ends, with the living organism, and which employs physico-chemical energies to accomplish its *meta*-physical purposes and designs, that is the real fact to be observed and to be accounted for. To revert to a former illustration. No one questions the fact that the quantity of energy taken in and consumed as fuel in the engine room of an ocean steamer is exactly the same in amount as the energy expended in driving the ship across the Atlantic, but of what earthly value is such a fact when proffered as evidence that there is no intelligent navigator aboard the vessel to superintend this "intake" and "output" of such mechanical energy, and to control and direct this power intelligently to carry out his specific design of crossing the ocean from New York to Liverpool, and of making that particular port and no other? Or who would argue that this intelligent agent was the mechanical resultant of the energy consumed as fuel? The Law of the Conservation of Energy works here as everywhere else, but it has no bearing on the point at issue. The real point to be observed is not that the amount of energy expended by the engines in driving the ship from New York to Liverpool was exactly equal to the amount consumed as fuel, but the fact that this entire "transformation" of energy was superintended by an intelligent agent, and made to carry out his peculiar purpose—the navigation of the ship from one specific point to another. If there had been no intelligent agent aboard, or if every intelligent agent had been suddenly removed for some cause, all these higher, "controlled movements" and "directed processes" would have drifted helplessly hither and thither, the mere sport of the mechanical influences of wind and wave. According to the logic of the mechanist, however, there should be no scientific reason for assuming the existence of any intelligent navigator aboard such a ship, and the thousands of voyages which take place yearly back and forth across the Atlantic and about the world generally,—exhibiting as they do the most carefully controlled, directed, and organized movements for the attainment of specific ends—call for no such despised "teleological" explanations or for any return to the ancient religious superstition of intelligent spirits or agents presiding over material forces, but these, as well as all other apparently "purposeful" and "intelligent" movements of our great ships over the seas, can only be "scientifically" explained by men of education and enlightenment as the purely *mechanical resultant* of the physical energies latent in the coal and water consumed in the engines, or the mechanical pressures exerted by winds and waves, or both of these together. Those who can swallow such nonsense are certainly welcome to do so, but why call it "science"? We have purposely put the matter thus baldly for the sake of emphasizing it, but the most serious, thoughtful, and pains-taking examination will assure any one that the fallacy is genuine, and that it lies at the root of all the attempted mechanistic interpretations of these higher phenomena of life and mind, as well as of every attempt to deny the reality of such meta-physical energies working in and through the world of mechanical forces. But let us continue the analogy a little farther. In precisely the same manner that the intelligence of the navigator *works through and by means* of the physical forces of fuel, steam, wind, *etc.*, to accomplish his higher ends, and inaugurate a new "movement" in Nature, propelled by its own distinctive energy and toward its own distinctive goal; so we contend that (1) the vital energy of the plant works through the physical and chemical forces taken into the organism as food to direct a higher "movement" of *growth, development*, and *reproduction*, and that the energy which so directs this last "developmental" movement orthogenetically to a specific goal, is altogether different in kind from the physical and chemical energies which it employs for this purpose. And so again, it is our contention that (2) the psychic energy of the animal, in turn, works through the lower vital and chemico-physical energies of the living body to contruct a neuro-muscular apparatus that through this organ it may direct a further "movement"—*i. e.* a "development" of neuro-muscular activity along the lines of instinctive rational responses, and purposive adaptations to surrounding environmental conditions—a "development" which is a first step in the progressive control of Nature by the intelligence of the organism. Similarly, this psychic energy which so directs this yet higher "developmental" movement orthogenetically to its own specific goal, is again altogether different in kind from either the vital or the physical energies which it employs in carrying out its higher purpose.

But once this view of the matter is accepted—once we assume, in good faith, that these diverse orders of energy really exist, and that the higher orders successively "invade" the field of the lower, subordinating them and assimilating them into their own greater systems, we shall have next to consider certain further biological and psychological matters more particularly concerned with the *modus operandi* of the process. In so far as vital energy is concerned, we have likened the process whereby it "invades" the field of physico-chemical forces to the analogous process whereby magnetic energy can be brought to bear upon a mass of iron particles, imparting its own characteristic properties to the group, and literally embodying its own peculiar mode of activity therein; and that there can be no inherent objection to this illustration is further attested by the fact that we have direct evidence of such energy, in the very act of performing this miracle, presented us daily in the spectacle of the life-energy, incarnate in the green leaf of the plant, constantly increasing its protoplasm, by absorbing and assimilating the chemical energies locked up in the CO_2, H_2O, NH_3, of its environment along with the physical energy of sunlight. Every new molecule of protoplasm that is formed today, is created by the agency of such already existent life taking up and assimilating the physico-chemical energies of the environment, and there can be no reasonable doubt that this same process has been going on from the beginning, and that the very first protoplasm to appear on earth, was formed in precisely the same manner—*i. e.* created by already existent vital energy coming into contact with physico-chemical forces and (like magnetic energy in the presence of iron) imparting its characteristics thereto, and literally incarnating itself therein. This view implies that life is a primordial form of energy, and this is precisely what we believe to be the case.

But while the process in this instance is comparatively easy to understand, the conception of the yet higher psychic energy imparting its peculiar characteristics, in turn, to the living protoplasm thus formed, is not, on first thought, quite so easy to visualize.

But only a moment's reflection will assure us that the evidence here is also immediately at hand, and is one of the most familiar experiences of every day life. For is it not true that we have the direct evidence of that intelligent agent, which we call the will, daily incarnating its conscious experiences and rational activities in the substance of the brain tissue? Is it not true that every psychical experience of the attention, as well as every idea, concept, imagination, or other voluntary creation of the will, proper, is "stored" up or "recorded" in some mysterious manner, in the structure of the brain, to be "revived" later on by the same agent (or, as we commonly say, "at will") in the form of a memory or recollection which serves, in turn, as an impulse to action repeated, habits acquired, *etc.* Is it not true again that the entire Mechanism of Broca (*i. e.* the mechanism of language, oral and written) represents the literal "embodiment" or "incarnation" of the conscious experiences and activities of this same psychic agency? Is not the whole process of education the result of the activity of this agent—the conscious effort of the will—directed to the embodiment or incarnation of its own psychical experiences and activities in such brain-mechanisms—the potential energies thus "stored up" therein, being subject to "recall"—that is, *reactualization*—in the activity of "recollection"? Nay, more—Is not the whole difference between the brain of the educated and the uneducated, the civilized man and the savage, essentially the difference between brains that have thus been organized under the influence of such invading or incarnating psychic agencies, and those which have not been so organized, or, at least, to a limited extent only?

Of course, we are here dwelling more particularly, upon the human aspect of the problem—the method by which that specific psychic agent, the self-conscious will of man, incarnates itself in the higher centres of the brain; but the same principle applies in the case of the animal. The only difference is that, in this latter instance, the psychic agent—which is here termed the conscious *anima*, soul, or psychologically speaking, the attention—is of a lower order altogether, and is concerned only with the building up of the lower centres of perceptual experiences, and the corresponding mechanisms of the yet lower instinctive, automatic, and reflex activities. It takes no part in the construction of the higher phronetic mechanisms peculiar to man.* In short, the sensations experienced by the *anima* or "attentive agent," and integrated by this agent into perceptual experiences, are incarnated in the nervous tissue to be "revived" again as "memories" of such experiences; while the emotional experiences associated therewith are also incarnated in like manner, and reappear in the numberless emotionally directed processes and activities which we denote involuntary instincts.

Whatever obscurity, therefore, may surround this mystery of the reception, embodiment, or actual "incarnation" of these psychic agencies in the substance of the living, protoplasmic material, there can be no question as to the fact, as all the phenomena of memory and recollection, whereby our original conscious experiences are "evoked" out of the brain and nerve tissue, wherein they are latent, indubitably testify; and we have only to follow the clue thus discovered to its logical consequence, to be convinced that all the mechanisms of the brain and lower nervous system have been similarly organized under the influence of such psychic or conscious agencies, and now subconsciously, automatically and mechanically, continue to repeat the numberless rational movements and intelligent activities characteristic of these agencies.§

Now just how these psychic agencies, after having thus incarnated their potentials in cerebral and nervous tissue, further succeed in incarnating them again in the germ plasm, may present some further difficulties, but even these are not insuperable, and have already begun to yield their secret. Strictly speaking, if such conscious agencies can directly organize the

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*It is only the mechanisms of speech and writing, together with those associated with reflective thought and volition (Campbell's "Intermediate Precentral Area") that are to be considered as indubitable constructs of the human will. The ordinary sensori-motor centres, as well as the centres of special sensations (sight, hearing, smell, *etc.*) and many of their interconnecting fibres, were long ago established by the instinctive activities of the animal mind—this spontaneous, rationalizing "urge" of the *anima* (attention).

§The specific physical effects (modifications of brain tissue) produced by these psychical agencies are usually termed engrams or neurograms, Their real nature is unknown; but there is little doubt as to their existence, and of the fact that they unite to form concrete "systems" or "mechanisms."

brain tissue, there is no clear reason why they should not just as directly organize the germ plasm. There is no clear reason for insisting on any intermediary as *essential.* But assuming, for the sake of argument that such a physical medium does exist, it just so happens that recent advances in the science of endocrinology have thrown a flood of light upon this problem by suggesting that the various hormones secreted by the ductless glands may themselves afford the very mechanism necessary to convey such influences from the external world to the germ cells. The idea, propounded by Mr. J. T. Cunningham in 1908,* and later elaborated by him in a work entitled *Heredity and Hormones* (1921) has been taken up with avidity by many writers, and a most interesting and far-reaching discussion of the possibilities involved has recently been presented by Dr. Louis Berman, of Columbia University, in his widely read book—*The Glands Regulating Personality.* While doubtless tending to exaggeration, and his argument vitiated by the usual mechanistic obsession, which blinds him to the equally as evident idealistic implications which the facts involve, his work is nevertheless of great value. We can only briefly consider here the common idea emphasized by these two writers. The gist of Cunningham's view as stated by Thomson is that bodily modifications due to environmental influences arouse the activity of the endocrine glands, which, in turn, liberate certain specific hormones which are carried by the blood to the reproductive organs, and there specifically affect the germ cells in such a way that the offspring reproduces something in the nature of the parental modification. "The chain would be like this: (1) An extrinsic change in surroundings, food, or habits; (2) a dint or imprint on a particular structure in the organism; (3) the liberation of specific products (of the nature of hormones), due to the modification in question, and their transport to the germ-cells; (4) a representative resultant in the offspring, due to the specific influence of the hormones on the relative 'factors' in the germ cells"§ While an excellent summary of the main biological side of the matter, it will be noticed that this epitome takes no notice of the psychological elements concerned in the process—*viz.*, the sensations, emotions, ideas, thoughts, which accompany these glandular activities, and which (as may easily be demonstrated) *can themselves both arouse, and be aroused by, these purely physical processes.* As we shall presently see, it is just here that psychology demands admission into the discussion, and is absolutely necessary to the true solution of the problem. Now the first important, though unfortunately biased, contribution to this side of the problem has been furnished by Berman in the work already mentioned. "The glands of internal secretion," says he, "as intermediaries between the environment and body, and between the body and the reproductive cells or germ plasm, tender the clue to a phase of the puzzle of heredity, adaptation and evolution. . . .The endocrines. .are *the material carriers* of the inherited physical and *psychic* dispositions, powers, abilities, and disabilities from the soma to the germ plasm and back from the germ plasm to the soma."[§] So far, so good; but the unfortunate part of Dr. Berman's otherwise fascinating discussion of the matter, is his singular failure to discern the true relation of the psychological factor to the physical processes, even after he has stressed the presence of this factor. As usual with materialists, he places the cart before the horse, and is blissfully unconscious of the logical absurdity underlying his position. With him the emotional and psychical side of the matter is a mere epiphenomenal by-product of the physical processes, and when once he has pointed out that the chemical elements contained in the hormones can, and do, affect the germ plasm, imagines that he has therein and thereby accounted not only for the possible acquisition of new physical and bodily traits, but for the acquisition of new modes of consciousness, mental capacities, experiences and activities. As a matter of fact, these statements are meaningless. No combination of C, H, O, N, or any other chemical elements can produce or in any sense account for a state of consciousness, and thought being the "product" of glandular secretion is but an ill-disguised return to the gross materialism of a century ago, as summarized in the crude dictum attributed to Cabanis that "the brain secretes thought just as the liver secretes bile". If our present day mechanists would only be content to subscribe to the sober declaration of Prof. Tyndall "that for every fact of consciousness, whether in the domain of sense, of thought, or of emotion, a definite molecular condition, of motion or structure, is set up in the brain," they would be far nearer the truth; and, in like manner, if Dr. Berman had been content merely to affirm that for every psychical trait or capacity actualized in the adult, there is a corresponding physical *concomitant* both in the brain and in the germ cell from which the brain, as well as the entire organism, originated, he would likewise be making a statement to which there could be little reasonable objection: but to make the physical structure, motion, or arrangement the *cause* of the psychical state, is quite another matter. For this assumption there is not one particle of evidence. No physical configuration of atoms or molecules can produce a state of consciousness (whether a sensation, a thought, or an emotion), and as the same great authority (Tyndall) tells us elsewhere, the passage from such a physical condition to a mental state is simply "inconceivable." Yet this fallacy, common to all mechanistic conceptions of life and mind, underlies all the argument set forth in this interesting and brilliant work. Coming to the root of the matter, then, it may be, and doubtless is true that the chemical substances composing the hormones are the immediate stimulators of the germ cells or germ plasm; but the point to be stressed is that other energies—*viz*: vital and psychical agencies, work through and express themselves in these physico-chemical energies, just as the artist expresses his idea through and by means of dabs of material paint, the musician his emotions in a combination of physical sounds; and the philosopher, scientist, or other thinker his profoundest intellectual conceptions and reasonings in the black splotches of ink on the printed page. The materialist has much to say about the effects of physical energies—light, sound, etc., upon the organism, but is strangely blind to the effects of the higher meta-physical energies working through these in definite developmental movements and manifesting themselves in the form of feelings, emotions, percepts, concepts, thought, *etc.* As already pointed out, the intellectual force which navigates the ship, guiding and directing it through numberless adverse conditions, to a certain goal, though working through and by the ordinary physical forces of heat, steam, wind, *etc.*, is not a product or resultant of these latter, but is, on the contrary, *an over-ruling power* which employs these lesser energies for its own higher purposes. But this is only one of many similar instances of the same principle. As a matter of fact all the higher organic, social, psychological, "developments" of Nature and of history—all the "evolutions" of art, civilization, law, religion, philosophy, science—indeed, all moral and intellectual "developments"—though taking place in a material world, and utilizing physical forces, and mechanical processes, are manifestations of Agencies altogether distinct therefrom—higher "over-ruling" energies. Now what we are here particularly endeavoring to point out, is that because conscious agents do, habitually, employ physico-chemical forces to manifest, and embody their own characteristic forms of activity, other conscious agents are affected not only by these actual physical and chemical energies so employed (and of which the mechanist would make so much) but also and especially affected by the higher spiritual energies working and manifesting themselves through these; and as a result they not only "feel" the "sensations" (aroused by these physical stimuli), but also the higher spiritual "emotions," "urges," cravings, ideas, and ideals, which these spiritual powers awake in them. There is nothing occult or mysterious about this, or anything that the plainest and most prosaic mind can not readily understand. To a dog, or even to a man if he be unacquainted with the Morse Code, the ticking of the telegraph is a meaningless succession of noises (*i. e.* auditory sensations), but to the operator these vibrations of sound are more than sensations—they are the physical carriers of a far higher influence, an *energy* or *power* which working though these media, affects his whole life in a profound manner—because of the message they convey. Likewise in reading a book, it is not the mere sensations of light (physical energies) impinging upon the eye that affect me, but the thought (spiritual energy) conveyed through and by means of these light impressions, that is the main influence experienced. It is quite true that dogs, and some men, experience nothing more than a series of light sensations, but there are, nevertheless, not a few of us who have the temerity to assert that the splotches of black characters on the white page which assail the eye, are the "material carriers" of a higher and more potent energy, whose effects are also felt and that whatever may be the purely physical effects of these lower energies upon our lives, we have reason to believe that the higher spiritual energies operating through them exert an even greater influence upon our lives and characters, and that, consequently, any attempt of science to ignore these greater environmental influences, when endeavoring to formulate a theory of development, is short-sighted in the extreme, and can never afford an adequate basis upon which the enigma can be solved. Now we have only to carry out this principle to its logical consequence to see how these higher vital and psychical agencies may further specifically affect the constitution of the germ plasm, determining the reproduction of similar activities in the developing organism. For just as these higher energies working through the instrumentality of molecular vibrations in nerves and brain cells arouse perceptual, emotional, and conceptual experiences, so these mental experiences, in turn, (especially the emotional) arouse glandular activities, the liberation of hormones in the blood stream, which yet in turn, being transmitted to the reproductive organs, influence the constitution of the germ plasm. The fact that the immediate stimulators of the germ plasm are probably the chemical energies constituting these hormones signifies nothing at all, for it is likewise true that the immediate stimulators of the brain cells in any ordinary perceptual experience, are also only physical energies. The real point to be observed is that as in the latter case, these purely physical energies prove to be "the carriers" of a higher spiritual influence, so also there is no good reason to doubt that the chemical energies employed in the former are likewise but "the carriers" of such higher forms of energy; and if not, why not? In a word, it is the effect of these meta-physical energies (vital and psychical agencies) upon the germ plasm that is the *prime* matter to be considered, for it is these higher influences, *and these alone* that dictate the arrangement and organization of the chemical and physical energies, and inaugurate, direct, and control the peculiar *evolutional and developmental processes* characteristic of living and intelligent beings which is the whole subject of our inquiry.

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*See also note at end of this chapter regarding the mneme theory of R. W. Semon.

§*Concerning Evolution,* pp. 174, 176.

[§] *The Glands Regulating Personality,* p. 317. Italics ours.

This conception then of psychic energy entering into the living substance of the germ-plasm, as the vital energy enters into the non-living substance of inorganic matter, and having become incarnate therein, reproducing its characteristic mode of psychical activity; mysterious as it may be, is nevertheless a by no means unheard of phenomenon, as, in slightly different form, the miracle is enacted daily and hourly before our very eyes. For only a moment's reflection will assure us that the same psychic energy in the form of communications received from other intelligent beings, is daily and hourly impressing itself, through the medium of molecular vibrations, upon the substance of the brain tissue, and having become incarnate therein, the emotional, perceptual, and ideational experiences which it originally set up, are reproduced time and again through life in numberless memories and recollections and their consequent activities. And, after all, as Ewald Hering and Ernst Haeckel long ago pointed out, *heredity is only a form of memory*—the racial (phylogenetic) memory, as distinguished from the individual memory. In a word, one is the incarnated mental experiences, responses, and activities of the individual only, registered or "incarnated" in the substance of the brain; the other is the incarnated mental experiences, responses, and activities of the race, registered on, or incarnated in, the substance of the germ plasm; the one is popularly termed memory, the other heredity, but there is no essential distinction between the two.

For the purpose of illustration, then, we may summarize the main sequence of events which occurs when one intelligent agent seeks to communicate his thoughts to another, in the following manner—though, of course, it must be understood that this is only one of many similar modes in which the transfer is effected.

A given intelligence, *A*, seeks to communicate his ideas, thoughts, and emotions to another intelligence, *B*. He may employ various physical forces. Most commonly, however, he employs sound or light waves—the first in the form of vocal utterances, the second, in the form of visible signs (the characters of the written or printed page). These energies transmitted, presumably as molecular vibrations, through the auditory and optic nerves to the brain, set up corresponding vibrations in certain cortical centres which are experienced by intelligence *B* as a complex of sensations. But while these light and sound sensations, the effect of physical energies, are, indeed, the *immediate* stimulators of consciousness, they are by no means the *only* influences received and experienced by the subject. As just explained, the conscious subject experiences the effects of a higher metaphysical, or spiritual energy transmitted *through and by means of these*, impressing itself in a further series of concepts, ideas, *etc.* Nor are these all. The ideas contemplated themselves arouse corresponding emotions. Thus, if the thought (idea) communicated concerns the death of a dear friend or relative, it immediately arouses an intense emotion of grief, which, in its turn calls forth the glandular activity of the eyes, in the secretion and shedding of tears. Nor are these the only effects of such ideas. The emotions so aroused insure the activity of various glands and muscles, with the consequent disturbance of various bodily functions, of the heart, stomach, liver, *etc.*, accompanied with numerous muscular contractions, gestures, movements, *etc.*;—all the physical and bodily effects of an idea.

But the particular point to be observed in connection with the present discussion, is the significant fact that all the emotions thus aroused, *have their corresponding physical concomitants—bodily processes, movements, and activities.* Indeed, it has often been remarked that an emotion is only the subjective side of what is objectively an instinct—that is to say, a physiological process, or series of glandular activities and muscular movements rationally (though blindly) progressing to a predestined end or goal.

As Pillsbury well expresses it—"Instinct is the process viewed from the outside, emotion is the same process viewed from within. Every emotion has its instinctive side, every instinct its emotional side." Moreover, these instincts, as just stated, are rational in character—always proceeding blindly, indeed, but orthogenetically and systematically to a definite goal and with all the outward appearance of purpose.

No more forcible illustration of the matter can be given than the well-known example afforded by the sexual urge. The mere vision (percept) of the female, arouses the corresponding sexual desire (emotion) in the male, which emotion correspondingly arouses, in its turn, the glandular secretions of the gonads, with the consequent, intricate series of muscular movements and activities which lead logically, and unerringly, to their rational end and meaning, in the sexual act. Indeed, the numberless instances in which animals seek to satisfy their emotional urges in the most intricate, and often long sustained, rational activities, all blindly, but unerringly directed to a certain goal, is one of the most astounding, but none the less undeniable facts confronting the scientific observer. The spiders weave their webs, the bees build their hives, the birds construct their nests, the beavers their dams and lodges—each species building true to a specific pattern, and often with the most amazing display of rational purpose—yet all urged to the undertaking and guided to the end by the power of pure feeling or emotion. Now, once we take in this fact; once we fully appreciate that both these outward and visible activities of animals (and often of men), as well as numberless corresponding physiological processes, going on within the organisms through the mechanisms of glandular activities, are all but the outward and physical manifesation of inward and invisible conscious states—feelings, emotions, *etc.*, and caused by these psychological agencies, we shall begin to see light. In saying this, however, we do not wish to be understood as affirming that when once a physical mechanism has been formed through conscious agency, it may not continue later to function subconsciously and automatically. On the contrary, this is just exactly what we do believe to be the case, and that it is through the channel of the germ plasm that these conscious experiences are further registered, and unconsciously revived in the automatic, yet orthogenetic processes of the development or ontogeny of each succeeding individual brought into the world. As aforesaid, the mechanism of heredity is simply the mechanism formed originally by conscious agencies in expressing conscious experiences, and which, like any other machines, constructed by intelligence, may be caused to reproduce these intelligent acts and processes blindly and mechanically. Even here, however, it is necessary to remember that an intelligent agent must be *in* or *behind* the machine to start it moving and operating. As the will or conscious agent "recalls" the experiences of former years, by starting the cerebral mechanism into activity; so also a living and intelligent agent must quicken the germ plasm mechanism into activity; and as the one, in so doing, reproduces the former acts and experiences of the individual, so also does the latter reproduce the former conscious acts and experiences of its racial progenitors,—*i. e.* the former conscious activities of the race.

Briefly stated, a sense-perception experienced by an animal, arouses a corresponding emotion; an emotion (which is but the other side of an instinct) arouses a corresponding physical process, or complex of physical processes, among which are glandular activities. These glandular activities expel hormones into the blood stream, these hormones are carried to the gonads, and their chemical constituents (chemical energies) impress themselves upon the substance of the germ plasm, functioning therein in precisely the same manner in which the molecular, or other energies, transmitted through the optic, auditory and other nerves to the brain cells also functioned, *viz*:—as the physical "carriers" of higher metaphysical influences (perceptions, ideas, thought, *etc.*), which are again (as in the former instance) to be "registered" so to speak,—this time in the substance of the germ plasm, and in the form of specific mechanisms which (like the corresponding memory-mechanisms in the brain) can automatically reproduce the original psychical activity.

What occurs in the case of the animal occurs also in the case of man, only that in this latter instance the initiating agent may be an idea or concept rather than a mere sense-perception. For ideas, no less than percepts, arouse emotions, emotions insure glandular activity and instinctive, rational processes; and these glandular secretions as hormones are transmitted to the germ cells, *etc.*

There is no inherent difficulty, therefore, in the conception of such a meta-physical agency as mind, or conscious Energy, imparting its characteristic properties and potentialities to living matter, even as vital energy—following the analogy of magnetic energy—imparts its characteristics and potentialities to non-living matter. Indeed, the materialist simply makes a difficulty here which in truth does not exist, by failing to take note of the fact that physical energies are thus commonly employed by psychical agents as vehicles for their meta-physical ideas, thoughts, and other activities, not only in every day conversation and intercourse, but in all the mechanical contrivances of modern invention. We are simply insisting, therefore, upon a due recognition of the significance of this well-known, indisputable fact. No one refuses to admit the fact as such; yet, strange to say, once they have admitted it, they make no use of it—treating it as a matter of no importance. But this cannot be done except at the sacrifice of logic. In short, there can be no minimizing the fact that the black characters that meet my eye when directed toward the printed page, though in themselves nothing more than the effect of light and molecular vibrations (physical forces) impinging upon the brain, are nevertheless the vehicles of a far greater influence. The sensations produced by these physical energies amount to little; but the meta-physical power operating in and through them (in the form of percepts, ideas, thoughts, *etc.*) exerts a profound influence upon my life and character—an influence which is further incarnated in the substance of the brain cells, to be repeatedly revived or actualized anew in memory and recollection. Nor does the influence of this meta-physical power cease with these experiences. As just explained, the same power utilizing yet other physical energies—perhaps mainly chemical energies

—transmits its influence to the germ plasm, and there re-incarnates its characteristic potentials, subject to yet later "revival" or "actualization" in those innate, instinctive, rational processes and activities which we speak of as the endowments of heredity.

But while it is by no means impossible that the hormones may thus play the role of intermediary mechanisms in transmitting influences between brain and germ plasm, I do not conceive (as I have already stated) that such an hypothesis is at all *necessary* to account for the enigma of heredity.

The very fact that the entire organism is a living whole—*i. e.* a completely vitalized unity—that each individual cell is instinct with vital energy, and in more or less intimate contact and association with every other—all this means that the effects of vital activity, wherever such activity be initiated, are in all probability transmitted from cell to cell throughout the entire mass; and since, as Cope has shown us, *all vital activity is directed by sensibility* (*i. e.* consciousness) this again means that psychic no less than vital influences are so transmitted, and register their corresponding effects throughout the protoplasm of the entire mass—including the germ plasm. In short, *life* and *anima* (soul or psychic energy) as completely "vitalize" and "animate" (respectively) the entire mass of the organic body, as magnetic energy completely "magnetizes" the entire mass of the iron bar.

In the light of such an hypothesis, then, the specific centres in which brain substance and germ plasm are localized—antithetical regions of the body—represent merely the opposite "poles" wherein a single polarising, organizing and rationalizing activity, inaugurated by the energies of life and mind, express themselves.

If protoplasm itself, then, is a product of primordial life operating in inorganic matter; and if life, in turn, but "energy directed by sensibility" (*i. e.*, consciousness); and if again, all physical structure and organization be also the products of life and consciousness: then, the entire mass of the body, with all its structural peculiarities even to the most ultra-microscopic details (engrams, neurograms, genes, and everything else) is simply an expression of life and consciousness. Whence it follows that all these physical phenomena become the "symbols" of the vital and psychical energies which created them, and as such (*i. e.* as "symbols" or "signs") directly or indirectly combine to "recall' the former to consciousness— *i. e.* "memory"; while the numberless sub-conscious, mechanical responses, reflexes, automatisms, instinctive movements, yes, even developmental processes or "evolutions" (*e. g.* ontogeny of the embryo), become simply the "reproductions" of these prior vital and conscious activities, or—as in the last mentioned instance —even the actual re-embodiment or re-incarnation of the agents themselves.

Once clearly understood, then, that life and mind as completely permeate the entire mass of protoplasmic material as magnetic energy completely permeates the mass of mass of iron or other metal—nay, more; once clearly understand that the former as completely organize or create the structural constitution of the body as the latter organizes or creates the peculiar molecular constitution of the magnetized metal, and we are not greatly disturbed by our immediate inability to trace all the successive steps through which such organization has been accomplished. While to know these details is important, it is by no means essential to the establishment of our argument. For whatever engrams, neurograms, genes, or other micromeric structures there be in brain or germ plasm, they are, in any case, the *products*, and never the *conditions* of the vital and psychical energies which they represent, and though performing important functions as vehicles for the storage and transmission of such energies, they must never be misconstrued as causes or conditions thereof;—a common fallacy which vitiates much of the biological literature of the day. Life and mind are the causes both of matter and material organization, but never the effects of such phenomena.

Summing up the entire matter, then, we may state our general conclusion as follows:—

Education—*i. e.* voluntary effort expended in unifying or rationalizing conscious experiences—progressively organizes the brain, (thereby rendering it capable of "memory," "recollection" and sub-conscious cerebration) and further indirectly and progressively organizes the germ plasm as well, rendering it capable of sub-conscious "re-production."

The so-called sub-conscious mind, both of animals and of men, then is the product of conscious activity—the mind working automatically through the mechanism which its own conscious effort has created. In the strictest sense, the sub-conscious mind includes *the entire body* outside of the conscious centres, since the entire mechanism of the organism is the product of such aboriginal conscious activity.

The germ plasm is simply the centre in which all the activities of this subconscious mind are finally integrated.

In a word, the brain and the gonads—the centres of conscious production and sub-conscious "reproduction" are the opposite "poles" of a single physiological and psychological polarity.

NOTE ON HEREDITY

It is impossible in the space at our disposal to go into a discussion of the vexed problem of heredity *vs.* environment, but from what we have just said in the preceding chapter, taken in connection with what was set forth in other Chapters concerning the meaning of type and species (*vide* especially our illustration of the kaleidoscope), it would be apparent that we must distinguish between the *essential "character"* of an organism and its *acquired "nature"*. It is the failure to note this most important distinction that is responsible, in our opinion, for much of the confusion which surrounds this problem.

a. The essential character is the fundamental "Logos" of the type—*i. e.* the fundamental "psychical pattern" or "system of potentials" resident in the integral of the development.

b. The acquired nature, on the other hand, is the sum total of the individual and racial "memories" or incarnated experiences represented by engrams, (in brain), genes (in germ plasm).

The one constitutes the primary and immutable "determinant" of all actions; the other the secondary influences, urges, habits (acquired by experience) subordinate to the control or inhibition of the former.

The first, in its totality, is the expression of the essential life urge (teleological urge or purpose) of the organism, which never changes its design, but which, where it cannot control its acquired experiences, "adapts" them to its unalterable end.

Better to illustrate my meaning, I would say that while I am in hearty sympathy with the hormonic or purposive psychology of such men as Wm. McDougall, Morton Prince, C. J. Herrick, and J. S. Jennings, who insist that there is an innate, teleogical urge in every organism which dominates and controls all other influences—utilizing these latter as means for the realization of its ends—yet I am also in agreement with Woodworth and Moore—to say nothing of the psychoanalysts Drever, Freud, and Adler—in asserting that there are also "acquired motives depending upon individual experiences" which must be reckoned with, and that "the driving power of habits" is of tremendous significance in determining the final result. I maintain, however, that in all normal cases of development these latter factors are subordinated to the control of the first, that (in man) the self progressively utilizes these influences (favorable or unfavorable) to effect its end—the building up of an Ideal Self. In short, I believe that in every organism, life is indeed a "struggle for existence," in which the innate, goalseeking *elan vital* persistently endeavors to utilize its constantly growing experiences and their "incarnated memories" to attain its end, by progressively assimilating these influences to the pattern of its own essential character (*i. e.* the pattern of its Logos). In doing so, there is many a conflict between the "inner" and the "outer" (the "primary" and the "secondary") and it is perfectly true that when the environment proves too unfavorable—and, further, adaptation thereto beyond the power of the organism to effect—life naturally comes to an end; but there is no compromise on the part of the essential Logos of the type. In short, the essential character (Logos) continues unchanged through all the fluctuating influences of environment; it is the secondary or "acquired character" that is subject to transformation. Again, in our opinion, it is only those experiences which have been assimilated into the "Logos" of the development that are inherited; all other "acquired characteristics" perish with the individual.

NOTE A

In a recent address delivered before the National Academy of Sciences Dr. Henry Fairfield Osborn is quoted as saying that "it now seems to be well established that one of the direct causes of the origin of species is the gradual and inherited modification of the geneplasm by the forces of the environment."

This is true; but even more important is the further fact that all the evidence now goes to show that in producing these "modifications of the geneplasm" the "forces of the environment" work through the instrumentality of *glandular secretions,* including (it is also important to note) the recently discovered "neurohumors" which Prof. G. H. Parker has been studying.

We have only now to add to these discoveries the further evidences concerning these "glandular secretions" which we have adduced in the foregoing pages to make the argument complete. In short, it is only necessary to say that these glandular secretions, in turn, are controlled by external *rational agencies* which work, through their instrumentality, upon the rational agent (soul) of the organism; and that it is not the particular chemical and physical effects themselves that produce the change of type, but these invisible rational agents which work through them directing and organizing their mechanical effects to realize their specific ends and purposes. What we have to remember, as well as impress upon the minds of our materialistic friends, is that all mechanism is the product of mind. The physical mechanism of the organism is itself the creation of rational agency—all blind mechanical processes leading to a definite goal are but the expression of some mind or psychic agent.

NOTE B.

The following passage taken from Bishop E. W. Barnes' recent work—*Scientific Theory and Religion*—which has been brought to my attention since the foregoing was written, will serve to supplement my view and throw further valuable light upon the matter. Speaking of why "favourable variations arise which not only the better fit an organism to its environment but also are inherited by its descendants," he has this to say:—"Because such variations are inherited they must obviously correspond to changes in the reproductive germ-cells. What excites such changes? We have already seen that mutations can be artificially produced by the use of short-wave radiation: but at the same time we recorded the opinion that such radiation as is always present at the surface of the earth would have to be a thousand times as intense as it is known to be to produce the mutations which occur in Nature.

"Lamarck believed in the inheritance of acquired characters. He thus held that the individual, in fitting itself blindly or consciously to its environment, acquired new characters which could be transmitted. Probably most Lamarckians would say that inheritance of new structural modifications, due to habit is a secondary matter. What is primary and essential is the inheritance of stored memories which habits imply. Some neo-Lamarckians contend that the sustained endeavour of the organism creates habits and thereby impresses memories on the germ plasm. Thus it is, they conclude, that characters, acquired by what Lloyd Morgan calls a hormic process, are inherited. The inward urge (*hormé*) drives the organism forward to its end.

"But the belief in the inheritance of acquired characters can be held without thus deeming it the result of an urge on the part of the organism. It may be postulated that there is in the germ-plasm or reproductive cells of the organism some change, an 'engram', fashioned in the course of its history and retained as a sort of structural or functional modification. This is substantially the mnemic theory of R. W. Semon (1859-1919). He argued that the immediate physiological effect due to the stimulation of irritable organic substance is but half the problem presented by observed facts. The other and distinctive half of the mnemic problem underlying the problems of memory, habit, and heredity, is the effect which remains in the stimulated substance after the excitement produced by the stimulation has apparently ceased. The capacity for such after-effect of stimulation, Semon called the *mneme.* Its result, which is the enduring though primarily latent modification in the irritable substance produced by a stimulus, he called the *engram.*

"Semon assumed that, when a new character appears in the body of an organism, some new engram is added to the cell-nuclei of the part affected by the new character. He also postulated that this change tends to spread throughout the body, even to the reproductive cells, and that it produces in them a faint copy of the original engram. Semon, however, felt it necessary to allow that efficient engrams could only be impressed on the reproductive cells slowly and by prolonged action. Among English botanists Sir Francis Darwin (1848-1925) accepted Semon's theory." (*Id.* pp. 508, 509).

NOTE C.

PRINCIPLES OF DEVELOPMENT

(Summary)

(I) Living matter (protoplasm) is formed out of non-living matter through the agency of pre-existent sentient life or energy (Note —life or vital energy—sentient or conscious energy, i. e. "Life is energy directed by sensibility"—Cope, *Primary Factors,* etc., p. 513).

a. Already existent life in the green leaf of the plant produces new protoplasm by acting upon CO_2, H_2O, NH_3, and sunlight. No evidences whatever that CO_2, H_2O, NH_3, and sunlight by themselves effect the synthesis, or produce life in any form.

b. See also Cope's entire theory of Archaesthetism; *Primary Factors of Organic Evolution,* Chap. X., *et seq.*

(2) All living matter (protoplasm) so formed is further differentiated, organized, and developed by the living agent (conscious energy) within it under stimulation of psychical experiences (responses to feelings, sensations, *etc.*)

a. Erasmus Darwin. (*Zoonomia* xxxix., 3.; cited by Osborn, *From the Greeks to Darwin,* p. 148). "Irritations" (*i. e.* sensations) of hunger, thirst, *etc.* Also pleasure, pain, suffocation, *etc.* Cited also by Cope, *Id.* p. 505.

b. Lamarck's Second Law. "The production of a new organ or part results from a new need or want, which continues to be felt, and from the new movement which this need initiates and causes to continue. (This is the psychical factor in his theory, which Cope later has termed Archaesthetism)."—(Cited by Osborn, *Id.* pp. 166, 167).

c. Herbert Spencer:—"Life necessarily comes before organization. . . .Since the passing from a structureless state to a structured state, is itself a vital process, it follows that vital activity must have existed while there was yet no structure; structure could not else arise. . . .Function is from beginning to end the determining cause of structure." (*Principles of Biology,* Vol. I., p. 167).

d. Huxley—makes the same affirmation, *Introduction to the Classification of Animals.*

e. Joseph Cook—"Huxley. . .says that life is the cause of organization, and not organization the cause of life. He has printed that opinion over and over (Huxley, *Introduction to the Classification of Animals*), and never taken it back. Well, if life is the cause of organization, probably it is safe to say the cause must exist before the effect. At least, that is Nature's logic." (*Boston Monday Lectures,* p. 90).

f. Lionel Beale—*Theory of the Bioplast* (*q. v.*)

(3) While all bodily differentiation, organization, and development are thus to be attributed to the stimulation of conscious states of some kind, so that, speaking generally, it may be said that all

evolution is a function of consciousness or conscious activity; yet the character of such "conscious states" differs widely with the "rank" of the organisms concerned. To wit:—

a. In plants and plant-animals (*zoophytes*), Evolution is stimulated by sensations only.

b. In higher animals (Neurobia), Evolution is stimulated by sensations, feelings, and emotions as interpreted in perceptual experiences (memories and percepts) only.

c. In man, Evolution is stimulated by sensations, feelings, emotions, and perceptual experiences, as further interpreted in ideas, concepts, and representations.

Now it is the peculiar role which is played by these last mentioned mental experiences (*viz*: ideas, concepts, representations) in directing the higher intellectual and moral evolution of man—that forms the next, and most important subject, of our inquiry.

As will presently be shown, a proper understanding of this subject affords the key to the whole problem of human, as distinguished from mere animal, Evolution; and likewise explains the relation of religion to science.

CHAPTER XIII

The Role of Parthenogenesis

THE implication of the foregoing views respecting the probable *modus operandi* employed by the transcendental agencies of life, mind (*anima*) and spirit, in effecting their successive "incarnations," together with the consequent "emergences" of aneuronic, neuronic, and phronetic types, should now be apparent. That these emergences were the products of external, environmental agents acting directly upon already existent developments is clear. The important fact to be observed, however, is that with the exception of the first of these emergences (*viz*: "living matter") which was the product of vital energy acting directly upon inorganic material, each of the subsequent emergences was the product of a similar external agent acting upon a pre-existent *organic* development, and that to accomplish their permanent embodiment or "incarnation" in such living material, it was further necessary that these transcendental influences should penetrate beyond the somatic cells and affect the actual substance of the germ plasm of the organisms involved. But only a moment's reflection will convince any one that such an event,—*viz*: the appearance of a new type of organism—brought about by *an external agent acting upon the germ plasm,* is strongly suggestive of a parthenogenetic origin of such periodic emergences. That is to say, each of these great emergences must have occurred as the result of a "mutation" effected by the stimulation of some external, environmental, organizing agent acting directly upon some totipotential germ cell—rearranging its potentials into a "new synthesis" or "logos"—quickening the same into parthenogenetic development—and so giving rise to a new type of individual. That such a complete re-arrangement of the potentials of the germ plasm could only be effected periodically—*i. e.* after long ages of exposure to the persistent influence of such transcendental agencies—goes without saying; and this again appears to be entirely in accord with the facts.

Now the possibility of new types thus arising, was long ago suggested by Kölliker, and it is significant that the particular place where he believed he had discovered evidence of the operation of such a principle was at the point of transition from the aneuronic to the neuronic type of organism which we have here been considering—at that very point where we witness the emergence of the highly individuated triploblastic Coelomata, or true animals, out of the less individuated, diploblastic Acoelomata, or plant-like organisms—a transition conspicuously marked even to-day by that strange interruption of the normal reproductive processes which has ever excited the wonder and astonishment of biologists—the phenomenon commonly designated "Alternate Generation." "How this law operates," wrote Professor Kölliker,—"what influences determine the development of the eggs and germs, and impel them to assume constantly new forms, I naturally cannot pretend to say; but I can at least adduce the great analogy of the Alternation of Generation. If a Bipinnaria, a Brachilaria, a Pluteus is competent to produce the echinoderm, which is so widely different from it; if a hydroid polyp can produce the higher medusa; or if the vermiform trematode "nurse" can develop within itself the very unlike cercaria, it will not appear impossible that the egg, or ciliated embryo of a sponge, for once, under special conditions, might become a hydroid polyp, or the embryo of a medusa and echinoderm." "It is obvious from these extracts," observes Prof. Huxley, "that Professor Kölliker's hypothesis is based upon the existence of *a close analogy between the phenomena of agamogenesis and the production of new species from pre-existing ones.*"* But while treating with great respect the views of this distinguished naturalist, Huxley was by no means inclined to accept the hypothesis, pointing out as an objection that the mutations effected in this manner never assumed the role of *permanent* forms. This criticism of Huxley (and of many others since that day) is, however, aside from the real point under consideration. It must be remembered that these forms were never cited by Kölliker as presenting anything more than an "analogy".

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*Italics ours.

To make such a criticism is to miss the whole point of the argument. No advocate of the theory (least of all Kölliker) imagines that the instances of parthenogenesis here referred to, or any other existing instances of the phenomenon, present actual examples of the formation of new types to-day. It is only the atavistic implications of these phenomena that demand attention; but the importance of these cannot be ignored. What is contended is that such existing instances of parthenogenesis, like the existing instances of hermaphroditism in the higher animals, or the double uterus, uterus masculinus, abdominal mammae, lanugo, gill-slits, *etc.*, in man—to say nothing of all the vestigial organs and rudimentary structures, generally, that occur in all higher organisms—though admittedly abnormal, and in many instances altogether useless phenomena to-day, are none the less of vast significance in telling the story of the past evolution of the race, and oftentimes reveal conditions and activities then existent, that would never otherwise have been suspected. Especially is this the case where organs, or even individual cells persist in functioning to a limited extent, and thereby setting up activities which are altogether abnormal at the present time, and which may, in some cases, prove pathological. Witness the conclusions which Darwin himself has drawn from the unusual, but by no means unknown, functional activity of the mammary organs in man, that at one time in the early history of the race, both sexes suckled their young.* Witness his further conclusion that at a still more remote period, the progenitors of the whole mammalian class were androgynous—a condition which Geoffrey St. Hilaire, and the more recent authority Debierre, go so far as to affirm persisted on within the human period. Witness yet again the remarkable conclusions to which pathologists like Adami, McCrae, Repin and Annsperger have been driven—that even within the human species today, there exist diverse orders of totipotential cells, and that the singular phenomenon of dermoid cysts, which occur so frequently in man, are now to be explained as cases—(actually

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**Descent of Man,* Chap. VI.

existent to-day)—of the abnormal or arrested development of such cells—*i. e.* cases of "abortive parthenogenesis" within the human species—and you will begin to realize the enormous significance of these much neglected phenomena. The truth is, there is here a world of obscure phenomena—little studied and less understood—awaiting the unprejudiced student of biology. The philosophy of parthenogenesis has never been worked out, and very confused and erroneous opinions are current concerning this strange phenomenon. Indeed, the entire subject of sexual Evolution has been studied only in a superficial manner. Enough is known, however, not only to warrant the opinion held by Darwin, Haeckel, LeConte, and other wellknown authorities that all existing sexual distinctions have been evolved out of an earlier state of self-fertilizing hermaphroditism; but that even such hermaphroditism was itself the product of a yet earlier evolution—the male and female elements present in the same individual having themselves been differentiated out of a single cell—that is to say, a primordial "totipotential" or "2*x*-Cell," capable of parthenogenetic development. "Monogony," says Haeckel, "is a universal life-process; even the ordinary cell-cleavage, on which depends the growth of the histona, is a cellular monogony. *Hence historical biology must say that monogony is the elder and more primitive form of parental generation, and that amphigony was secondarily developed from it. .It is important to emphasize this because, not only some of the older writers, but even some recent ones, regard sexual generation as a universal function of organisms, and declare that it dates from the very beginning of organic life.**

Present sexual distinctions, then, have only come into existence as the result of a long process of development—they did not obtain at the beginning—and this significant fact proves of vast importance when we come to consider the probable *origin* of those fundamental phylogenic types or "natural species" to which our attention is now directed. If any mode of generation were involved in the first appearance of these "natural species," it must have been some form of agamogenesis. That is to say, the primitive protoplasmic unit must have "spontaneously" developed under the stimulus of some environmental influence. But let us look somewhat more closely into the matter.

**Wonders of Life*, pp. 240, 241. Italics ours

If we go back far enough, we discover that the male and female principles now separated in distinct individuals, were formerly united in the same individual, that the present state of unisexuality has been differentiated out of a primitive state of bisexuality or hermaphroditism. That we are not here indulging in any fanciful speculations of our own, but merely stating a fact universally recognized by biologists, will be apparent from a few other quotations from recognized authorities. "There can be little doubt that hermaphroditism was the primitive state among multicellular animals."* "Comparative anatomy shows that hermaphroditism, that is the union of both kinds of sexual cells in one individual, is the oldest and original condition of sexual differentiation: the separation of the sexes did not originate till a later period."** Again, "Just as the lowest plant-animals exhibit this most simple origin of the complex phenomena of reproduction, so, in the second place, they reveal the highly important fact that the earliest and most primitive sexual relation was hermaphroditism, and that the separation of the sexes originated from this only secondarily (by division of labor)."§ Darwin also repeatedly affirms that the sexual condition of the vertebrates has been in all probability derived from a primitive hermaphrodite state. "Some remote progenitor of the whole vertebrate kingdom appears to have been hermaphrodite or androgynous."† Again, "The early progenitor of all the vertebrata must have been an aquatic animal, provided with branchiae, with the two sexes united in the same individual."††

Many other passages to the same effect might be cited, but as the fact is generally conceded, it is unnecessary to adduce further evidence. As throwing some light on the gradual character of this differentiation, however,—the successive stages undergone in the process—we quote the following from LeConte:—"First, the sexual elements, sperm-cell and germ-cell, are separated, but in the same organ. Then the organs, spermary and ovary, are separated, but in the same individual. This is the condition of *self-fertilizing hermaphroditism* so common among plants and lower animals. Then comes cross-fertilizing hermaphroditism; and Nature takes much pains and uses many ingenious devices to prevent self-fertilization and insure cross-fertilization. . . .Then, in order absolutely to forbid self-fertilization. . .the sexes are separated in different individuals, and fertilization can only take place by voluntary union. . . .Last of all, differences between the two sex individuals becomes greater and greater as we go up. It is conspicuous only in vertebrates and some insects, and very conspicuous only in birds and mammals."* Not only then is it clear that the present state of unisexuality has developed out of a primitive hermaphroditism, but it is also evident that this primitive hermaphroditism in turn underwent a development of its own. It was only in its last and highest stage that the male and female elements were placed in separate organs—spermary and ovary. In a prior stage, these organs have not yet been differentiated and the sexual elements though separated, were separated in the *Same Organ.* But is there any reason to suppose that we have here arrived at the true origin of this progressive differentiation of male and female elements? By no means. Prof. Haeckel assures us that even the diverse glands, separating the cells, within the same organ, are themselves derived in all probability "from a common rudiment"—"a primeval and simple hermaphrodite gland,"§ and Laulanie, Ploss, Sutton, and others substantiate this position from an embryological point of view, while others yet again, insist that this bi-sexual condition is to be traced even into the constitution of the primordial germ cell itself—*i. e.* to an "intra-cellular hermaphroditism," or as it has also been expressed, an "intraprotoplasmic sexuality". Thus, LeDantec of the Sorbonne, maintains that sexuality is merely the expression of a certain "bi-polarity" which is universal in living matter, penetrating even within the confines of the cell itself as an inherent characteristic of its protoplasm. He recognizes three orders of sexuality: —

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*Id. p. 604.

***Geddes and Thomson, Evolution of Sex*, p. 78.

§*Haeckel, Evolution of Man*, Vol. II., p. 69.

†Id. p. 396.

††*Descent of Man*, Part I., Chap. VI., pp. 156, 157.

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*_Evolution and Religious Thought,_ pp. 239, 240.

§*Evolution of Man,* Vol. II. p. 401.

(1) *Individual sexuality*—the ordinary bipolarity which exists between separate male and female individuals—unisexuality.

(2) *Histological or genital sexuality*—the bipolarity which exists between the separate male and female cells produced within the same individual,—hermaphroditism; and

(3) "*Intracellular sexuality*"—the bipolarity which exists between certain elements within the protoplasm of a single cell ("Intraprotoplasmic sexuality") and which manifests itself in the phenomenon known as *Parthenogenesis.*[*]

In other words, according to this view of the matter, the capacity which certain cells exhibit for self-development (parthenogenesis) is due to the fact that they contain both male and female potentials within their own germ plasm, and while there may be differences of opinion respecting the details of the matter, as well as regards some of the terminology employed in the explanation, substantially this view of the *bi-polarity* of parthenogenetic cells (2x-cells) is generally adopted by embryologists. It was upon the assumption of such a bipolarity that Prof. John McCrady many years ago advanced his theory respecting the significance of the "polar globules" regularly expelled by the unfertilized ovum at the period of maturation—a theory afterwards "most carefully elaborated by Minot" and stated at length in Balfour's *Comparative Embryology.*[§] How this view was developed to explain the phenomenon of parthenogenesis, may best be given by quoting the passage from Brooks cited above. "Within recent years an hypothesis regarding their significance (*i. e.* the polar globules) has excited considerable notice. This hypothesis, which was first advanced by the late Prof. McCrady, and which is stated at length in Balfour's *Treatise on Comparative Embryology,* is that each sexual element originally contains a male portion and a female portion; the ripe male cell is the male half of the male element, and the 'polar globules' contain the male substance of the ovum, which is discharged in order that it may be replaced by the male element from the body of another organism. Balfour says. . .To the suggestion already made. . .I will venture to add the further one, that the function of forming polar cells has been acquired by the ovum for the express purpose of preventing parthenogenesis. . . .There can be little doubt that the ovum is potentially capable of developing by itself into a fresh individual, and therefore, unless the absence of sexual differentiation was very injurious to the vigor of the progeny, parthenogenesis would most certainly be a very constant occurrence; and on the analogy of the arrangements in plants to prevent self-fertilization, we might expect to find some contrivance both in animals and plants to prevent the ovum developing by itself without fertilization."* Geddes and Thomson sum up the matter by saying that, "according to some" (McCrady, Minot, Balfour, and others) "the egg-cell is in a sense hermaphrodite. . . . .and the function of forming polar cells has been acquired by the ovum for the express purpose of preventing partheogenesis."** The quotation adduced from Minot also is very explicit:—"In the cells proper, both sexes are potentially present; to produce sexual elements the cell divides into its parts; in the case of the egg-cell, the male polar globules are cast off, leaving the female ovum."§

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[*] See *Nature and Origin of Life*, Chap. XXXII. *et seq.*

[§] See Brooks's *Heredity*, pp. 70, 71; Geddes and Thomson, *Evolution of Sex*, p. 106.

Without attempting to go further into the details of the matter, then, we may say that the general upshot of all the opinions expressed, leads to the conclusion that the process of sexual evolution has been represented by three distinct stages:—

(1) Stage of "Intracellular Sexuality"

The stage that Minot calls "Intracellular Hermaphroditism," and which functions in the phenomenon of parthenogenesis.

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*Brooks, *Heredity,* pp. 70, 72.
***Evolution of Sex,* p. 106.
§*Id.* p. 106.

(2) Stage of "Histological or Genital Sexuality."
Hermaphroditism proper; represented by at least two substages—*a.* Glandular; *b.* Organic.

(3) Stage of "Individual Sexuality."
Unisexuality.

This means that the cycle of development was ushered into existence through parthenogenesis; that the "intracellular hermaphroditism" conditioning such parthenogenesis soon gave way to the stage of "histological hermaphroditism," and this, in turn, to that of "unisexuality," in consequence of a persistent process of differentiation, whereby the male and female principles, originally co-existent in the plasm of a single cell, were gradually separated, (1) into distinct male and female cells within a single gland (the process of such separation being now represented, embryologically, by the expulsion of the polar globules); (2) through the further separation of these cells into different organs or receptacles in the body of a single individual; and (3) through the final separation of these cells, and their characteristic organs, into the bodies of distinct (male and female) individuals.

Now the bearing of these facts on the problem immediately under consideration is plain. It means that each *true* species—that is each "palaeontological" or "natural species" must have sprung from a single cell in consequence of some process of agamogenesis. This further implies that when once the primordial living protoplasm had been brought into existence through the operation of transcendental vital energy acting directly upon inorganic matter (in the manner already described) and the emergence of vegetal life thus assured, all subsequent emergences—such as the "creations" of animal and man—were likewise the consequence of similar transcendental agencies acting now upon the living, organic material—or, to be more explicit, upon the *germ plasm* of such living organisms.

Now it is interesting to note that a view closely resembling this (though approached from an altogether different point of view) has been recently hinted at by Dr. Austin H. Clark, of the U. S. National Museum, in his work *The New Evolution* or

Zoogenesis. As stated elsewhere, Dr. Clark believes that the major groups of animals represent independent evolutions. So far as these groups are concerned, says he, "the creationists seem to have the better of the argument. There is not the slightest evidence that any one of the major groups arose from any other. Each is a special animal complex related, more or less closely, to all the rest, and appearing, therefore, as a special and distinct creation. But within each major group, we see a very different picture. Here the fossil record shows a constant change from one horizon to another. These successive variations are probably simply indicative of a direct response to physical alterations in the environment, favoring now one type or subtype, now another. This continuous alteration of the elements within the various groups is what is commonly known as Evolution ("Animal Evolution," *Quarterly Review of Biology*, Dec. 1928, p. 539).

When now the further question is asked, in what precise manner the Creative Power operated in bringing these separate phyla into existence, Dr. Clark replies:—"The process leading to, and resulting in, the first appearance of some representatives of each of the major groups may be known as Eogenesis,"* Eogenesis is defined as "the simultaneous formation, through following different developmental paths, from the primitive single cell, of all the major types of animals. . .Thus the only fact of cosmic significance in the whole subject of Evolution, in its broadest sense, is the appearance of *the single cell. The single cell has inherent in itself the potentiality for development, through selective and progressive reduction in various directions, and in various ways, into every form of life which at any time may be capable of existence and of self-perpetuation under the conditions obtaining at that time.* All animal types are, therefore, to be regarded, in their relation to cosmic evolution, simply as varied and varying manifestations of the inherent potentialities of the fundamental substance protoplasm."§ In a word, Dr. Clark maintains that each of the great phyla of the animal kingdom, originated from the "spontaneous" or agamogenetic development of a single cell, which had within itself the potentials of all the diverse forms that were later differentiated. Now up to this point, we find ourselves heartily in sympathy with his view of the matter. Beyond that, however, we find it necessary—so far as our understanding of his language is concerned—to add a number of qualifications. Thus, while we believe it to be true that each major group originated out of a single, totipotential (*i. e.* parthenogenetic) cell, we do not regard it as *necessarily* true that they all originated from the *same* cell, nor—assuming a plurality of such totipotential cells—do we regard it as necessary to suppose that these primary cells were all coexistent and of *the same order*—all endowed with the *same potentialities.* To begin with, there is just as good reason to assume that the primal protoplasm out of which these phyla evolved, appeared as a number of distinct units, scattered over a large territory, as there is to suppose that it was included in a single cell, appearing in a single locality. This point, which involves the old controversy of the Polygenists vs. the Monogenists, is after all of minor importance. The real point to be considered is, were these primitive cells coexistent in time,—were they all of the same order—and possessing exactly the same potentialities for subsequent development; or were they of diverse orders, endowed with widely different capacities, and existing (some at least) in different geological eras. Now, in our opinion, there is no indication whatever that the primordial totipotential cell, or cells, which ushered in the Porifera and Coelenterata (to say nothing of plant life) were of the same order—endowed with the same capacities—as the totipotential cell, or cells, which gave rise to the Echinodermata, Mollusca, Arthropoda, and Vertebrata. Furthermore, while it is true that the geological record is too imperfect to permit of any exact conclusions regarding the precise period in which each of the major groups originated, yet the general implication of the combined evidence derived from many quarters, is certainly to the effect that plants, sponges, and coelenterates (Aneurobia) long preceded the remaining groups (Neurobia) in appearance, and this, together with the vast divergence in character between the two—a distinction which we have shown, involves fundamental biological and psychological potentialities—compels the conclusion that the primitive cells from which the Aneurobia and Neurobia originated were themselves totally different *in kind.*

**The New Evolution*, p. 213.

§*Id.* pp. 215, 216.

So much, therefore, respecting our points of agreement as well as disagreement on the general question concerning the origin of these major groups. When now we come to consider the further problem as to the origin of man, it will be evident that our view of the matter differs widely from that of Dr. Clark. It is true that Dr. Clark, like Prof. Osborn, denies the descent of man from the ape, believing that man, along with the rest of the Primates, descended from some more remote animal of the Eocene. "The conclusion that man was man as early as the Eocene—as early as the time of the little Eohippus—has far more in its favor than the assumption that man is directly connected with the modern apes."* But while he thus denies the current idea of an evolution of man from the ape, he continues to hold the view that he is simply a mammal, nothing more; just another twig upon a branch of the vertebrate tree. Whatever characteristics he may possess, either of mind or body, intellect or sense, are simply actualizations of certain potentials that were inherent in the primordial, totipotential cell out of which the whole vertebrate phylum has evolved. That he is committed to this conclusion is obvious. For once having assumed that man does not constitute in himself an independent phylum—is not one of the major groups—it follows that he is only one more of those numberless differentiations or "variations" of the vertebrate germ plasm produced in "direct response to physical alterations in the environment" (*supra*). Unlike Wallace, Mivart, Wasmann, Osborn, and others who deny that man's intellectual and spiritual powers have been derived from his animal progenitors, or can in some way be explained as an evolution therefrom, he is committed to the view that these higher psychical characteristics are as much the actualizations of capacities latent in the brute as any other; that man, in other words, is simply a brute that has, in some purely accidental manner, been subjected to peculiar environmental influences which served to evoke these long-hidden potentialities—potentialities in no wise peculiar to him, but latent in every mammal—nay, more, latent in every vertebrate.

**The New Evolution*, p. 229.

Now note this all-important point. We also believe that man came into existence as the result of "a peculiar environmental influence" acting upon some purely animal form; but we do not believe that the result of this external stimulation was *merely* the "bringing forth" or "actualization" for the first time of certain potentialities all along latent in the germ plasm of that animal. But, on the contrary, we believe that the effect of this "peculiar environmental influence" upon the germ plasm of this mammal was to add something that it did not hitherto possess—*to endow it with new potentials,** and consequently, to re-arrange its former "Logos"—to form a "new synthesis" (as the advocates of "Emergent Evolution" express it) and to quicken the new order of cell so formed into parthenogenetic activity whence the birth of a new type—the "emergence," through "mutation" of a new order of organism—the "creation" of self-conscious, self-determining man. There would be no need for such an explanation of the matter, were the intellectual and spiritual powers of man "of the earth earthy"—a further development only of certain natural brute instincts and capacities. But it is precisely this evidence that is wanting. The difference between man and ape on this side, is not a difference of *degree, but of kind;* not the difference between two "terms" in a mathematical series, but the difference between any "term" of such a series and its "limit". The difference between the brute and man is not the difference between a polygon of eight sides and a polygon of sixteen sides, but the difference between any polygon (however great the number of sides) and a circle. To attempt to explain man's nature by assuming that he is nothing but a very highly developed brute, is like attempting to prove that the circle is nothing more than a highly developed polygon—that the limit of a development is of the same order as the variable that approached it. All this is, as we have seen, untenable. To those

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*N. B. This additional factor is not to be construed as a new *physical,* but a new *metaphysical* factor—a new "potential".

who admit, therefore, that there is anything in man that was not derived from his alleged brute ancestors—any intellectual, moral, and spiritual powers which could not be explained as an "evolution" out of purely animal "potentials"—there is no alternative but to assume either that he was created altogether *de novo,* or else that his creation was the result of an *infusion* into a purely animal nature of potentialities altogether foreign to that nature—the result, in short, of some kind of "inbreathing" of a higher order of energy. It is this view that we have taken, but in doing so we have further stressed the fact that such an "inbreathing" must have penetrated to the germ plasm and fundamentally transformed its constitution. The obvious inference from this, in turn, is that man came into existence as the result of a *parthenogenetic mutation.*

That is to say, a mutation brought about under the influence of an external, organizing agent acting upon the purely animal germ plasm. We emphasize the fact that it was an "*organizing*" agent, and not some commonplace physical energy of the material environment which, in itself alone, could never have effected such a change of rational type. What we mean to say is that only an "organizing" agent could effect a re-organization of the germ plasm (a "new synthesis" of potentials) and the only "organizing" or "rationalizing" agents that we know anything about are the agencies of *life* and *mind.* Chemical and physical forces may indeed be utilized by life and mind to effect "organization," but they cannot of themselves effect it. They are merely instruments through which these higher agencies accomplish their ends and purposes. While, therefore, we willingly admit that chemico-physical energies may and do produce effects upon the germ plasm;—nay, more; while we willingly admit that, under the proper conditions, such purely physical energies may quicken a parthenogenetic cell into full developmental activity, we do not believe that the product of such physically induced parthenogenesis will be ever anything but an individual of the normal type or species. There will be no emergence of a new species and no "new synthesis" of potentials. It is not merely the stimulation of such a cell into activity that is demanded, but the complete re-organization of its fundamental constitution—the complete re-arrangement of its "potentials" into the unity of a new "logos"—a "new synthesis"—and only an "organizing," "rationalizing" agent such as life or mind, working through the instrumentality of purely physical energies, can effect this result. In a word, there is no reason to believe that ordinary parthenogenesis, induced through physical conditions of the environment *alone*, ever resulted in the "emergence" of a new type of organism. But, on the other hand, there is reason to believe that such new types have so originated, at periodic intervals, under the higher agencies of life and mind.

That the eggs of many animals, amongst whom sexual reproduction is the rule, can be caused to develop parthenogenetically by the artificial application of some physical stimulus, has been well established ever since the memorable experiments of Jacques Loeb on the ova of sea urchins and starfishes was given to the world, and the further fact that totipotential cells of diverse orders are known to exist even amongst the highest animals, and can, under peculiar conditions be stimulated into development, makes it impossible for the impartial student of the subject to define the precise limits within which the phenomenon is necessarily restricted. It is true, indeed, that as we ascend the scale, the phenomenon of parthenogenesis becomes increasingly rare, but it is also true that the possibility of experimenting with the unfertilized ova, or other totipotential cells, of the highest animals is correspondingly great, and there is no way, as yet discovered, by which the question can be put to a practical test. So far as man himself is concerned, all that can be said is that with the exception of the remarkable case reported years ago by Morel, in which the first stages of the development of a human ovum, under conditions altogether precluding the possibility of fertilization, were observed, and which Dr. Repin regards as of sufficient importance to warrant serious consideration,* all the many other cases of partial parthenogenetic developments have been distinctly pathological in character, resulting only in various cysts and tumours. As

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*Repin—*Origine Parthenogenetique des Kystes Dermoides de l'Ovarie*—pp. 93, 94.

pathological phenomena, however, they indicate a lingering potentiality for such a form of reproduction even within the human species*—a fact, which in itself, suggests a story of the past which no consistent Evolutionist can refuse to acknowledge as of supreme significance, while it simultaneously warns the impartial investigator against a too hasty denial of the possibility of such an event recurring to-day even in the human species. Indeed, if the hypothesis first propounded by J. McCrady, and afterwards elaborated by Minot, Balfour, and others, concerning the polar globules extruded from the ovum at the time of maturation, be true, it would follow that the ova of all animals are, at the beginning, potentially capable of developing independently, and that the power to expel the polar cells "*has been acquired by the ovum for the express purpose of preventing parthenogenesis.*" (Balfour). In short, if such an interpretation be true, it means that the ova of all mammals (not excepting man himself) are naturally capable of self-development at the outset of their career, and that only the expulsion of the polar globules prevents parthenogenesis taking place normally to-day;—a fact which obviously carries with it the further conclusion that if any slight disturbance of the function of maturation should occur to-day in any of these higher organisms, we should actually expect the phenomenon of parthenogenesis to be repeated. It was in view of this general opinion, advocated in one way or another by many different authorities that Romanes was led to make the startling assertion:—"The earlier stages of parthenogenesis have been observed to occur sporadically in all sub-kingdoms of the Metazoa, including the Vertebrata, and *even the highest class, the Mammalia.* These earlier stages consist in spontaneous segmentations of the ovum; so that even if a virgin has ever conceived and borne a son, and even if such a fact in the human

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*Dermoid cysts, which are frequently met with in the human species, are now "explained as parthenogenetic developments from unfertilized ova." (Thayer—*Pathology*, p. 572. See also Adami & McCrae— *Pathology*, pp. 324-327; 760.) Again—"The more recent studies of Repin and Arnsperger," observes Adami, "most strongly support the view that ovarian and testicular dermoids can only be regarded as examples of abortive parthenogenesis." (*Medical Contributions to the Study of Evolution*, p. 285.)

species has been unique, still it would not betoken any breach of physiological continuity. Indeed, according to Weismann's not improbable hypothesis touching the meaning of polar bodies, such a fact need betoken nothing more than a slight disturbance of the complex machinery of ovulation, on account of which the ovum failed to eliminate from its substance an almost inconceivably minute portion of its nucleus."[§]

Nor, may we add, have the most recent investigations of embryologists served to invalidate this general conclusion. For whether or not this particular interpretation regarding the significance of the "polar globules" be accepted, there is nothing in the latest facts known to geneticists, and other present-day investigators, that precludes the possibility of such an occurrence. Indeed, in that most interesting work on *Scientific Theory and Religion* written by Bishop Ernest W. Barnes, F. R. S., and which has recently received the endorsement of some of the greatest living specialists in science, we find the whole matter summed up in the following brief but significant statements—"Presumably there is no reason in the nature of things why a virgin birth should be impossible. . . . .I have, personally, little doubt that biological research will in due course prove a human virgin birth to be possible."* This, as we have said, is the deliberate conclusion of the writer, based on the very latest embryological data.

But if such a conclusion is true, its implications are clear and far-reaching. In a word, if *all* ova before maturation are *potentially* capable of self-development, it is obvious that parthenogenesis *may* occur anywhere in nature under certain conditions. It is only necessary that some suitable stimulus, other than the male element, be brought to bear upon the ovum at this particular stage in its natural development. Now we know that such stimuli exist, and they have actually been used with success in the artificial parthenogenesis of many lower forms of life. That, up to the present time, we have not been able to apply such chemical, and physical agencies to the ova of the higher animals at this particular stage, because of the natural physiological difficulties which beset such experiments, can obviously not be urged as an argument against our thesis. It still remains a fact that the analogy of nature leads us to believe that the same principle holds good in these cases that is known to be true in others.

[§] *Darwin and After Darwin,* p. 119.
**Id.* Lecture XIII., pp. 451 *et seq.*

"Almost any eggs," observes Julian Huxley, "which are easily accessible to the experimenter by being laid into the water—including those of sea-urchins, starfish, worms, snails, and even frogs—can be made to develop unfertilized. . . .In mammals the ovum is inaccessible to the experimenter, so that we do not know whether artificial parthenogenesis is possible. *There is no reason to suppose that it is not.* Surgery and experimental technique are advancing rapidly, so probably we shall find out very soon."*

But again, we cannot state too emphatically that even if it were possible for us to arrest the expulsion of the polar globules in man, or some higher mammal, and subject the ovum, in this condition, to the influence of some physical stimuli, such as were successfully employed by Loeb in the case of lower organisms, and thus should actually produce parthenogenesis in these higher organisms, yet *we do not believe that any departure from the normal type would result.* It is only those specific influences which, as we have said, possess the peculiarity of being what are called "organizing" agencies—agencies like *life* and *mind*—that can, in addition to merely quickening the cell into developmental activity, further re-arrange or re-organize its constituent "potentials" into a "new synthesis" or "logos," and so insure the "emergence" of a new type. That such "organizing" agencies do exist—that they work through inorganic and organic materials to effect their purposes, until finally when the organization is complete, they appear as definite "emergences"—completely embodied or "incarnated" agencies—plant and animal and man—is a fact which can never be successfully disputed. It makes no particular difference by what names they are called. Whether you prefer to use the old-fashioned names with which they have ever been associated, or

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**Science of Life*, p. 449. (Italics ours.)

whether you prefer the more technical phraseology of recent writers you are, after all, dealing with the same realities. Changes of name by no means necessarily involve changes of fact; and many of our latest and most impressive scientific terms, though intended to impress the public with the idea of some new discovery, are after all wholly concerned with the same old forces and the same old phenomena that we have known from childhood. If you prefer you may follow the terminology of the Energists, and some biologists, and speak of them as (1) Vital or Biotic Energies; (2) Psychic and Cognitic Energies; (3) "Mind-Energies" proper, Cogitic or Spiritual Energies. After all, it is three distinct "orders" of energy that you are dealing with. It is necessary to observe that each of these agencies operates on its own peculiar "plane". Each is a something *sui generis;* an ordering, directing, organizing agency, capable of controlling the energies subordinate to its plane—utilizing them as "means" or "instruments" to carry out its own peculiar ends and purposes. The first of these organizing agencies to appear, is what we call vital or biotic energy. This energy acting directly upon a complex of physical and chemical energies, "integrates" their potentials in a definite "synthesis," endowed with a specific "Logos," from which "integral" emerges living matter (protoplasm)—the development of aneuronic life (plants and plant-animals). The second organizing agency—psychical energy—acts, in turn, upon the living protoplasm, re-arranges its potentials again into a "new synthesis" or "Logos," from which new integral emerges a new type of organism—an organism endowed with an *anima,* soul, or psychic principle—hence an "animal" proper. The outward and visible sign of the "incarnation" of this new psychical principle, is the appearance of a definite psychical apparatus in the midst of the protoplasmic (vegetal) material—*viz*: the nervous system characteristic of all the higher Metazoa. Before such an incarnation of the *anima,* or psychic energy could have been permanently effected, however it is obvious that the germ plasm latent in the reproductive cells of the lower development must have come under the influence of this "transcendental" agency in order that the Logos of potentials characteristic of the lower aneuronic development, might be completely changed, and the "new synthesis" of potentials characteristic of the higher, neuronic development be formed. These conditions imply, therefore, that the emergence of the new animal type was the result of a *parthenogenetic mutation,* brought about by the action of this organizing psychic agency on some totipotential cell of the lower aneuronic development. Finally, the third organizing agency—spirit (πνευμα) or spiritual energy is brought to bear upon the vital and psychical potentials of the animal nature—re-arranges these potentials, in turn, into a "new synthesis" or "Logos," whence again "emerges" a yet higher type of organism—an organism now endowed with a "spirit"—(*i. e.* self-conscious, self-determining principle)—man. The outward and visible sign of the incarnation of this new spiritual principle is the appearance of a definite phronetic mechanism (phroneta, thought and speech centres; mechanism of Broca). Here again it is obvious that before a permanent incarnation of this spiritual agency could have been effected, it was necessary that the germ plasm of the animal should have come under the influence of this transcendental agency, in order that the Logos of potentials characteristic of the animal organism might be completely transformed, and an altogether "new synthesis" of potentials, characteristic of the higher nature of man established. But this again implies that the emergence of man was the result of a parthenogenetic mutation, brought about by the action of this organizing spiritual agency upon some totipotential cell present in the reproductive organs of the animal.

With the three fundamental emergences of life (plant), mind (*anima*) and spirit (man) thus accounted for, we are brought face to face with the final question that confronts theology, and which the church must either meet fairly, squarely, and rationally, in an honest, scientific manner, or else abandon the claim that the doctrine of the Virgin Birth (in the plain sense in which that doctrine has always been received) can be harmonized with the teachings of science. The implication of the argument is plain. It may be a question whether or not a higher type than "natural man" has yet appeared on earth. It may be a question, worthy of the most careful consideration, whether He whom the civilized world for centuries has proclaimed the "New Adam"—the type of a new order of manhood—"spiritual man" as opposed to "natural man"—Whom we have even gone so far as to assert was actually "God incarnate," the union of the human and the Divine—the *"God-Man"*—were really all that we have ever believed and asserted. But if this claim is to stand—if He is still to be regarded as a being different *"in kind"* from ourselves—a new type—a genuine "emergence"—the Head of a new species of man then, following the analogy of all previous organic emergences, we should expect to see His Incarnation accomplished through a parthenogenetic or virgin birth. If the foregoing explanation be true in regard to other emergences—if all antecedent emergences were "incarnations" of transcendental agencies accomplished through the instrumentality of the germ plasm; by re-arrangement of the potentials resident therein, with consequent formation of "new syntheses," consummating in parthenogenetic births, it would be against all scientific precedent to assume that this last "incarnation" of the Divine Spirit would be an exception to the rule. Accordingly, we assume that the same process occurred in this instance as occurred in all previous emergences.

We assume that the same *Divine Spirit,* (the Spirit of Righteousness) which had been speaking to the hearts of men ever since the world began; which the Hebrew prophets first discovered to be a *World Spirit* guiding the course of human history to a certain, foreseen Goal;—*viz*: the embodiment of a perfect social organism ruled over by a King, so perfect in righteousness, that he could not be distinguished from the absolute "incarnation" of the Spirit of Jehovah Himself: we assume that this same "organizing" and "directing" Spirit which thus awoke this vision in the mind of man, was at the same time, slowly but progressively *embodying* that vision "in the flesh" of man. *That, in fact, the vision forced upon the mind, was itself merely the effect of a movement already going on in the body of race—hence a vision bound to be "incarnated" in the course of time.* We assume that the Virgin Birth was simply the final, and inevitable step in this process of the progressive "incarnation" of this Divine Spirit in the life of Humanity. We assume that this transcendental organizing influence which had for generations so profoundly moved the mind of Israel that it had at last become an Abiding Presence in their midst—a very obsession of the national mind—at length registered its effects upon the plasm of the race, and through the instrumentality of a Jewish maiden the miracle of miracles was at last accomplished.

Now the main justification for the above conclusion will be readily seen to lie in a principle which we have discussed at length in the preceding chapters. Briefly, we believe that spiritual agencies, like psychical and intellectual agencies, not only register their effects upon the brain cells, but these effects can, in turn, be transmitted to the gonads, and thus effect the constitution of the germ plasm. It has long been suspected that some kind of connection exists between nervous processes and reproductive processes—between *experience* and *heredity*—but it is only since the close relationship between emotional experiences and glandular secretion has been brought to light that, in the opinion of many, the key to the solution of the problem has been given us.

We now know that it is not physical and chemical forces alone that affect us. It is not light, sound, and molar forces that alone leave their "impresses" upon the brain. These, indeed, produce the effects which we call sensations, and the energy latent in a sensation we know is in some manner potentialized in the brain tissue. But that is not all. *The organized* sensations are interpreted as perceptual experiences, and their re-actualized potentials (the "revived" impressions) are experienced anew as images, memories, *etc.* Moreover groups of "organized" perceptual experiences and accompanying memories, are interpreted as ideas, concepts, and the like, and these, in turn, are linked together in thought-processes, judgments, reasonings, *etc.*, which yet again are accompanied with definite emotional experiences, and activities.

Thus, the lower physical and chemical forces become the "carriers" of higher psychical, intellectual, and spiritual agencies, which themselves work along their own definite lines of activity for the accomplishment of certain definite *ends*, and which impress us with their corresponding emotional and dynamic effects? But the point to be observed particularly is that these distinctive dynamic agencies not only register their effects upon the brain—to be revived in memory-sequences, and corresponding emotions—but the emotions they set up in turn, arouse the endocrine glands into activity, and the hormones, or products of such glandular activity, convey the effects of the emotions throughout the system, and are now believed to act directly on the germ plasm—registering their effects in that substance, precisely as in the brain tissue.* In a word, whatever influences (psychical, intellectual, or spiritual) are capable of "incarnating" themselves in the brain tissue are also capable of "incarnating" themselves in the germ plasm. It may be, and doubtless is true, that the brain is the organ primarily affected by these influences, and that the emotional experiences and activities resulting from this partial embodiment are not ordinarily of sufficient duration and intensity to affect the constitution of the germ plasm to any marked extent. But where such influences affect a Race persistently through historic ages, the case is different. Moreover the numberless instances now known to psychologists where, under the abnormal conditions of prolonged trance, ecstasy, and hypnosis, visions, emotions and other experiences, leave their impress clearly and unmistakably stamped upon the bodily constitution and its functional activities—and that in a manner which does not suggest exemption of any one organ—we have presented a series of well authenticated phenomena which are fraught with endless possibilities. Not only have the famous stigmata of St. Francis of Assisi, and St. Catherine of Siena been duplicated in many other instances of ecstasy, but similar phenomena, in endless variety, and affecting all parts of the body, not excepting the reproductive organs themselves, have been artificially induced by suggestion. We do not have to go to works of fiction or pseudo-scientific literature to verify these statements. Men of the highest scientific standing and attainment—men whose reputation is world-wide and authoritative—have time and time again attested the truth of these and similar phenomena, and even our ordinary text-books of abnormal psychology will furnish all the evidence necessary to sustain our main contention here. The ordinary blush is a commonplace example of the physical effect produced by an emotion—a definitely localized congestion of the capillaries. "Stigmatization," observes Dr. Cutten, "is only a blush in a certain limited area, and in bleeding stigmatization the blush becomes so violent that the blood bursts through the skin. A blush is not an abnormal phenomenon, and the stigmatic blush is but an exaggeration of this."* To those, however, who may be inclined to question the truth of this last statement, I herewith submit the following from a recent and wellknown scientific authority. Says Julian S. Huxley, "the most famous man to receive the stigmata was St. Francis of Assisi, but there are now several score cases (mostly women) on record, many of them quite recent, *and authenticated without any shadow of doubt*. . . .In every case, the stigmatization has only appeared after prolonged meditation upon the passion and crucifixion. . .In these it would seem that the Unconscious is again showing its amazing power over bodily functions that are beyond conscious control, just as it does in hysteria by producing mental blindness or lack of memory, in hypnotism by raising blisters or causing temporary paralysis. Stigmatization is the most startling of all such phenomena and can probably only occur when a man or woman *is in that exalted mental state called ecstasy* by the mystics, or in some approach to it."§ In a word, blushing, blood-sweating, hemorrhage, localized inflammations, blisters, stigmata proper, etc., *are* all closely related phenomena, and can all be produced—and have been many times produced—by hypnotic suggestion. Moreover, by means of the "suggestion," the phenomenon can also be localized, or made to appear in any part or organ of the body, and the functional activity of that organ be aroused or inhibited, as the case may be. That these phenomena are not of every day occurrence, goes without say-

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*i. e. in physical structures (genes?) analogous to the "Engrams" of the brain.

***The Psychological Phenomena of Christianity*, p. 84.

§*The Science of Life*, pp. 1350, 1351. Italics ours.

ing. Ecstasy, trance, and extreme cases of hypnotism, are themselves phenomena which the average man seldom comes in contact with, and he is naturally loath to give credit to many statements, which are never questioned by the real student of the subject. Furthermore we must remember that what is so strange to the American mind is by no means unfamiliar to men in other quarters of the world, and it happens to be a fact that trance, ecstasy, and hypnosis, have been actually cultivated for centuries in the East in connection with religious rites and worship, and the Bible itself is full of allusions to these matters and the "visions" associated with them, in close connection with the practice of prayer and prolonged fasting. Indeed, the whole picture of the Annunciation as presented in the Gospel, when considered in the light of the circumstances leading up to it, presents us with a little group of deeply religious souls awaiting in awful expectation "the coming of the Lord"—watching, fasting, praying, dreaming dreams and seeing visions; and it was only when the limit of this spiritual preparation (which indeed had been going on in Israel for generations) reached its climax in the mystical "Vision" of the angel vouchsafed to Mary, that the miracle was consummated. Wrapped in an ecstasy of speechless prayer, she sees a "Vision," hears a Voice, receives a "Suggestion," and instantly the "Incarnation"—so long awaited—becomes a fact.

But there is no need to pursue this line of evidence further. Suffice it to say that if the peculiar "Influence" latent in the ecstatic "Vision" of a Francis of Assisi, or a Catherine of Siena, can leave its physical effect clearly defined and localized in those regions of the body naturally indicated by the character of the Vision,* there is no reason whatever to doubt that the "Spiritual Influence" latent in the holy Vision vouchsafed to Mary, could register equally as definite effects. And if it be now a well established fact that under the abnormal conditions of trance, or ecstasy, or hypnosis, the stimulus of an "idea," a "suggestion," can arouse the "functional activities" of other organs of the body, it is but the folly of absurdity to imagine that those specific organs, which even in our normal waking moments, are, of all others, peculiarly influenced by "suggestion," should prove, under these unusual conditions, to be the sole exception to the rule.

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*e. g. The nail prints in the hands.

But, in bringing this chapter to a close, let us once more provide against a misinterpretation which will almost certainly be placed upon these statements. It is not to be inferred from anything that has been said, that we regard parthenogenesis in the human species as a phenomenon which is at all liable to occur under normal conditions to-day. What we do affirm is that the absence of the phenomenon within this particular sphere must not be interpreted to mean, either that it could not, under any possible circumstances occur to-day, or that there are not indications that it has occurred in the past, and that in connection with the origin of "Natural species". As long as totipotential cells exist within the human body; as long as they continue to develop spontaneously to a certain point, even though the result be pathological; as long as the human ovum, before maturation, is known to be potentially capable of self-development, and the first stages of such a parthenogenesis have been actually observed to occur—the phenomenon cannot be regarded as beyond the realm of possibility; for, in the words of Romanes (already quoted) "such a fact need betoken nothing more than a slight disturbance of the complex machinery of ovulation on account of which the ovum failed to eliminate from its substance an almost inconceivably minute portion of its nucleus." The *possibility* of such an event, therefore, is plain enough. The main obstacle that prevents the occurrence of such a phenomenon to-day, is not the lack of any potentiality in the ovum at this period, but its general inaccessibility to ordinary physical influences. Physical stimuli which have been artificially applied with success to the eggs of sea-urchins, starfishes, and other animals, when at this particular stage of their development, can not easily be brought to bear upon the human ovum at such a period; while the possibility of psychical influences, such as we have just been considering, being brought to bear, contemplates not only the existence of a peculiar mental state of deep intensity which is, at best, of rare occurrence but the simultaneous coincidence of a specific "suggestion," as well as a number of other conditions. It is needless to say that such a combination of unusual circumstances, is not likely to be met with—especially in a civilization that has neither the time nor inclination to waste its energies in weeks of fasting, prayer, and mystic contemplation.

But aside from all this, even if it were possible to induce the phenomenon to-day—either by physical or by psychical means—we re-affirm that the result of such an undertaking would be nothing more than the birth of an ordinary individual of the species. There would be no "emergence" of any new order of being. The emergence of a *new type,* is inextricably bound up with the *rational* character of the external agent. It is not every agent that can perform the miracle. The starfishes that were artificially produced by means of ordinary physical and chemical agencies, were just ordinary starfishes. Nor is there any reason to believe in the case of man, that any ordinary physical stimulus could insure a mutation from the normal type. The whole force of the argument is lost, if we fail to take notice of this essential fact. Though there may be many agencies capable of stimulating development in a totipotential cell, it is only an agent of a specific kind, operating under specific conditions, that can *transform the constitution* of *such* a cell (*i. e.* form a "new synthesis" of potentials) and so insure the emergence of a new order of being. In short, only an "organizing" agent of some kind, operating upon a plane *above that* in which the subject of the influence "lives, moves, and has its being" can accomplish such a result; and it is only at long geological intervals that such transcendental agencies have been known to operate. Moreover, when we come to examine the several "emergences" which have occurred in times past (life, mind, spirit), the evidence goes to show that the "event," though appearing suddenly, was in all probability but the climax of a long period of antecedent preparation.

Whatever might have been the precise stages in the development of inorganic matter which preceded the actual emergence of living protoplasm, which it is difficult for us now to discern, in both of the subsequent emergences, a long continued, antecedent *convergence* toward the goal is clearly manifest. Thus, before the actual emergence of mind, (anima) manifested in the appearance of true multicellular individuality in a centralized nervous system, there was a long period of social convergence (unicellular Coenobia, colonies, and states —pseudo-individuals) accompanied by the appearance in the higher coelenterates of isolated nervous centres and tracts, gradually converging to ultimate unification in a central ganglion (Vermes). So likewise, before the emergence of spirit, characterized by the appearance of human individuality manifested in that supreme ganglion of nervous centralization, the brain of man, there had been a long period of convergence toward this goal. This process of convergence is first generally apparent in the increasing integration of the nervous system in the vertebrates, but it becomes especially apparent in the higher mammals, where the rapid development of the cerebral hemispheres is clearly prophetic of the end. In short, there is every evidence, in both these cases, that the transcendental agency works for a long period within the body of the race before it finally affects the constitution of the plasm, and the long anticipated "emergence" of the new type as suddenly appears.

Now just such a transcendental, organizing agent is that "over-ruling" spiritual influence which we term the Holy Ghost or Holy Spirit, and in just such a manner had He been working within the body of the human race for centuries—unifying, centralizing, harmonizing, spiritualizing,—before His omnipotent power, at a certain definite point in human history, and in the person of a certain, definite individual, reached the very plasm of the race, and with the quickening of His touch the "long predicted," long awaited "Incarnation" was effected.

To sum up the entire matter, the Virgin Birth with which we are concerned—the Virgin Birth that ushered in a new Type of being—the *God-Man*—was no ordinary case of parthenogenesis, such as is witnessed frequently in the animal kingdom, and may even possibly be made to occur artificially in man. It could not have occurred at any time or place indifferently, or have been the consequence of just any ordinary stimulus, whether physical or psychical. It was a *racial* event—a *phylogenic consummation.* It meant the attainment of a certain "*limit*" (mark the word) in the *natural* Evolution of the human race, and the ushering in of a new cycle of *spiritual* Evolution, in the person of a new order of Individual—a new kind of man—the Second Adam—a Being both God and Man—hence the God-Man. His emergence—like all the preceding emergences of organic development—was the result of parthenogenesis, but a parthenogenesis effected by the "World Spirit"—a Spirit operating upon a plane above the plane of our humanity—a Spirit that "descended" into our human nature "from above" (ἄνωϑεν)—a Spirit which had for ages been working within the hearts of all men, but progressively manifesting His Divine Power only amongst those particular peoples who were most responsive to His call—developing especially through the channel of the Hebrew race, then more especially through the tribe of Judah, and always with increasing might among "the chosen few" who continued faithful to the call, till finally the limit of spiritual concentration and power was "focussed" in a single Individual, who thereby became the favoured instrument through whom His complete "embodiment" in human flesh was finally accomplished.

Strange, then, as the foregoing conclusions may appear to the mind of the orthodox physical scientist, only a little unbiased reflection should assure him that they have been inferred from premises well known and generally accepted by the scientific world.

For, after all, the gist of our whole argument may be summed up in the statement that the great emergences of *life, mind and personality* are the result of changes ("new syntheses") periodically effected in the constitution of the germ plasm by peculiar environmental agencies; and surely there is nothing in such a conception that is in the least at variance with universally accepted scientific principles.

What difficulty there may be for the traditionalist in science lies not in this general assumption, but in the further specific assumption that such environmental agencies are not mere physical and chemical forces, as ordinarily supposed, but the organizing agencies of life and mind which utilize such physical and chemical forces for their own specific ends and purposes.

As long as any theory of development confines itself to the possibilities of physical and chemical forces *alone;* well and good—it will be given a welcome consideration. But once begin to talk about the agencies of *life* and *mind* as factors in the evolutionary problem—once assume that these despised "*meta*-physical potencies" can work "through" and "by means of" these lower physical forces to effect their own ends and purposes;—nay more; once assume that they can even change the constitution of the germ plasm of a given cell through the instrumentality of such lower energies, and so—becoming "incarnate" therein—can ultimately inaugurate their own higher and distinctive developmental movements in Nature; and immediately the so-called "scientific mind" (!) is offended.

But objections of this kind need not be seriously considered, as they are obviously the fruit of a most unscientific dogmatism which, in the light of present-day events, cannot hope to stand the test of critical examination. The age of such materialistic and mechanistic explanations—even for physics—has gone forever, as is now attested by all the leading authorities in this department (*e. g.* Jeans, Eddington, *et al.*) and the biologist must learn his lesson even as the physicist has learned his. In short, there is nothing that can be more certainly demonstrated than that life and mind are organizing agencies, utilizing, controlling, and directing physical and chemical energies to their own higher ends and purposes. As Sir Oliver Lodge cogently expresses it "I perceive, not as a theory, but as a fact, that life is itself a guiding principle, a controlling agency, *i. e.* that a live animal or plant can and does guide or influence the elements of inorganic nature. The fact of an organism possessing life enables it to build up material particles into many notable forms—oak, eagle, man,—which material aggregates last until they are abandoned by the guiding principle, when they more or less speedily fall into decay, or become resolved into their elements, until utilized by a fresh incarnation; and hence I say that whatever life is, or is not, it is certainly this: it is a guiding and controlling entity which interacts with our world according to laws so partially known that we have to say they are practically unknown, and therefore appear in some respects mysterious."* I conceive this statement to be irrefragable, and it is noteworthy that Sir Oliver Lodge is by no means alone in this opinion, as similar statements have time and again been made by other eminent authorities. But to accept it, is to accept the implications which it necessarily involves regarding the successive geological "incarnations" of life and mind and spirit —a matter which is not so clearly understood.

But even this is not all. We can see more or less clearly how the agencies of life, mind (anima) and spirit (self-determining will) have successively "incarnated" themselves in the course of cosmic development, but it has not, as yet, fully dawned upon the minds of men that a fourth agent—the "Power not ourselves that makes for righteousness"—the Power that shapes the course of human history, and controls the moral and intellectual development of human society—has also after centuries of persistent pressure brought to bear upon the minds and consciences of men, become "incarnate" in our human nature, and has inaugurated a new cycle of spiritual Evolution which can have no ending short of the complete integration of humanity in God.

We can see more or less clearly how life became incarnate in inorganic nature; how mind (anima) became incarnate in plant nature; how spirit (self-determining human will) became incarnate in animal nature, but we are slow to take in the significant fact that, in precisely the same manner, the Divine Spirit (the Spirit of righteousness) has now become incarnate in human nature. Yet, after all, this is only what the analogy of Nature would logically lead us to expect. The only obscurity surrounding the subject, therefore is one that Christian people themselves make by refusing to interpret the doctrine of the Incarnation in terms of the theory of cosmic development. Indeed, there are few Christians who take their theology seriously, and still fewer who take interest enough in scientific matters even to attempt an interpretation of the Incarnation in the light of the general idea of cosmic development. Once realize, however, that the whole process of spiritual growth and development (spiritual Evolution) with which the Church is concerned, is simply the last stage in a process of cosmic development which has been going on through untold aeons, and the Incarnation is not only seen to have a logical place in the scheme of events, but is seen to be the key to the whole "Riddle of the Universe"—the "one far off, divine event to which the whole creation moves."

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*_Life and Matter_, pp. 133, 134.

Once realize, therefore, that what Christian theologians call the *Holy Spirit*—that "Power not ourselves that makes for righteousness"—Who controls and directs the social Evolution of the race—that spiritual "Urge" or "Power" that ever commands obedience to the moral law—the voice of the stern "I ought" which each man feels within his soul—the voice of "the Categorical Imperative" (Kant);—once realize, we say, that this transcendental and impelling Power is nothing more or less than a living, organizing Agent in our midst, progressively "incarnating" Himself in our human nature;—once realize that it was *in* and *through* the Person of Jesus of Nazareth that His Divine Character, and the significance of His work first became known or "revealed" to the world so that men could intelligently enter into voluntary union, and cooperation with Him in the carrying out of His Divine Purpose;—once realize, indeed, that through that "revelation" of the Christ this all-sanctifying Influence has become "embodied" or "incarnated" in a social organism (His "Spiritual Body" which we call the Church);—once realize, in other words, that through this "mediation" of Jesus of Nazareth—in short through Jesus Christ as "Mediator"—this Spirit of the Living God "has taken upon Him our flesh", entered into our humanity, and so inaugurated a new order or type of manhood, *viz*: spiritual man, as opposed to natural man:—once realize again, that this means that Jesus Christ stands before the world as the spiritually begotten Germ or Embryo out of Whom this *new cycle of spiritual Evolution* has "emerged,"—

Once clearly take in the significance of these fundamental facts, and we will begin to see light.

In short, we assert that the "incarnation" of the Divine Spirit in our human nature—an event which has taken place within the historic period—constitutes a cosmic "emergence" every whit as important and significant to the student of cosmic development as the corresponding emergences of life, mind, and spirit, in the geological past; and that the same unique conditions which surrounded the "birth" or "emergence" of such former types, must naturally be expected in the case of this highest and greatest of all emergences—the God-Man of theology.

In conclusion, then, we once more summarize the entire matter by saying that just as life became "incarnate" in inorganic nature; just as mind (anima) became "incarnate" in plant nature; just as human spirit (*i. e.* self-determining will) became "incarnate" in animal nature; so also has the Divine Spirit now become "incarnate" in human nature.

Moreover, it is to be particularly noted that every such "emergence" or "birth" of a new type, is a birth "*from above*"—*i. e.* a "miraculous" or "Virgin Birth." For every such "emergence" or "birth" has resulted, not from the normal process of sexual generation, but from the action of an agent transcendental to, or "above" the plane of the development in question, *descending into it and lifting it to the sphere above.* Thus plant life is the result of Vital Energy "descending into" inorganic matter and "lifting it" to the plane of living organic matter. So also, animal life is the result of psychic Energy working in the plasm of vegetal life—human life the result of Spiritual Energy working in the germ plasm of the animal; while the Christ life is the result of Divine Energy (the Holy Spirit) working in the germ plasm of humanity. The Virgin Birth of Christ, then, is no exception to the law of Nature, but, on the contrary, is exactly what the whole analogy of the cosmic process leads us logically and necessarily to expect. The difficulty arises only when we fail to take in the fact that Christ is not an ordinary man, but an "emergence"— a "new type" of man—the Head or Beginning of a new species of manhood. If he were an ordinary man, he would have been born in the ordinary way. But the whole significance of Christ consists in the fact that He was not "just another prophet or good man," but *a new type* of man. In short, Christ was an "emergence," and like every other emergence that has ever taken place, was the product of "a Power working from above" and "upon" the germ plasm of the development in question, and not of any power working normally within it. He was "born from above" (ἄνωϑεν), by the power of the Spirit (the operation of the Holy Ghost)—not from below, by the operation of the normal male energy. To sum it all up, He was born "not of blood, nor of the will of the flesh nor of the will of man, but of God."

The whole process of cosmic development, then, is seen to be but the progressive embodiment—in a series of more and more comprehensive "individuations"—of the underlying "rational principle" of the universe; the final or complete embodiment of this "World-Reason" being synonymous with what theology calls the Incarnation of the Divine Logos.

NOTE

In justification of the statements made in the foregoing chapter, the reader is especially asked to consult the following authorities:—

Adami—*Medical Contributions to the Study of Evolution,* p. 285; p. 338.

Adami and McCrae—*Text-Book of Pathology,* p. 325.

Balfour—*Embryology.*

Brooks—*Heredity.*

Darwin—*Descent of Man,* Part I., Chap. VI.

Debierre—*L'Hermaphrodisme.*

Geddes and Thomson—*Evolution of Sex.*

Gould and Pyle—*Anomalies and Curiosities of Medicine,* p. 202 *et seq.*

Haeckel—*Evolution of Man; Wonders of Life,* and other works.

Repin—*Origine Parthenogenetique des Kystes Dermoides de l'Ovaire,* pp. 93, 94.

SUMMARY

LAW OF PARTHENOGENETIC DEVELOPMENT

(1) Any totipotential cell may (under certain conditions) be quickened into parthenogenetic development under stimulation of agencies other than the normal male element.

(2) If the environmental stimulus be nothing more than some ordinary physical or chemical energy (or combination of such energies) the resulting parthenogenetic development will result in nothing more than a reproduction of the normal type. If, on the other hand, it be a Vital or Psychical agent of another and higher order of "logos", a 'new synthesis" of potentials will be effected in the plasm of the toti-potential cell, with the result that a new and higher type of organism will be brought to birth.

(3) Such new types (emergences) occur at periodic intervals in the course of cosmic development, and only after the transcendental, quickening agent has been slowly but progressively influencing the germ plasm of the race through a long period of time.

It cannot be asserted too often or too emphatically, however, that, in our opinion, no simple chemical or physical force, or any combination of such forces, *alone,* can ever effect a change of type. That chemical and physical agencies can cause parthenogenetic cells to develop is well known, but the final product is nothing more than an individual of the normal type. No change of fundamental type will ever be brought about by such agencies *per se*. Only a rationalizing or organizing agent working through the instrumentality of such forces can effect a re-arrangement of the genotype, and the only *rationalizing* or *organizing* agencies that we know anything about are the agencies of *life and mind*. In short, what we have to face is the fact that only life and mind have the power of rationalizing matter—hence, have the power of producing the specific *psychological types*.

Finally, instead of regarding the cosmic process as a simple, uninterrupted evolution or unfolding of the potentials latent in matter in the successive appearances of life, mind, and self-conscious personality; we must be prepared to reverse our point of view completely, and interpret the cosmic process (from above downwards) as the progressive unfolding, in a series of "emergences," of the potentials latent in the DIVINE MIND—(1) in the objectification of His Will as Energy *per se* (matter); (2) in the embodiment of this sentiency in matter as *life*; (3) in the embodiment of His "percipient consciousness" as *anima* (soul); (4) in the embodiment of His self-conscious, self-determining mind as *personality*; until finally (5) in the "Incarnation of His Divine Logos" His complete GODHEAD stands revealed.

PART II.

SCIENCE AND THE INCARNATION

Cosmic Development may be defined as an orthogenetic process in which the Rational Principle that governs the movement (i. e. the "logos" of the "integral" out of which the development proceeds) is progressively *embodied—the End or culmination of the movement being the* complete *"embodiment" of this Rational Principle or* "World-Reason" *in material form.*

But this scientific conception of the ultimate embodiment *of the* World-Reason *is identical with the theological conception of the ultimate* "incarnation" *of the* Divine Logos. *Hence Science agrees with Christianity in proclaiming the "Incarnation" as that "one, far-off divine event To which the whole creation moves."*

CHAPTER XIV

Personality and Human Development

THE great problem which we now come to consider, *viz*:—the problem of *human evolution*—is one which has been little studied and is very imperfectly understood by the average Evolutionist. The biologist has much to tell us about the evolution of plants and animals—nay, he has even much to say about the evolution of man out of the animal, but when it comes to the further evolution of man as man, he is strangely silent. Of course, in a general way he affirms that human development is, in the main, an intellectual movement—a progress in civilization and culture—but beyond some vague observations on this wonderful growth of man from the uncivilized to the civilized condition, he has little to say. He has no very clear ideas regarding the essential conditions which determine this higher form of Evolution, and is utterly at sea regarding the End or Goal toward which it is tending. The reason for such bewilderment is easy to understand. The problem of higher human Evolution being, as we have just said, one that is mainly concerned with the intellectual, aesthetic, and moral development of man is necessarily a psychological rather than a purely biological problem, and involves numberless metaphysical, philosophical, artistic, and religious experiences, which are beyond the sphere of the specialist in physical science to discuss. Yet while obviously unable to throw any light on these higher problems himself, he is strangely prejudiced against all attempts on the part of philosophers, psychologists and theologians, to investigate them. Explanations coming from such sources are "unscientific" in his opinion, being based upon phenomena which do not come within the range of the microscope, the retort, or the balance; which are not the subject of laboratory investigation, and, in fact, cannot be discovered anywhere in the whole realm of objective, sensuous experience.

With persons of such limited views, it is impossible to argue. You cannot convince the color-blind of the reality of colors; and just as there have always been people in this world who have no appreciation of poetry, music, or art—nay, more, just as there have been, and always will be, people that cannot see the point of a joke—so there are, and there always will be people to the end of time, to whom everything beyond the purely physical and material—everything *meta*-physical —is "foolishness". Suffice it to say however, that real science is not limited to any one category of human experience; and it is just here that the words of one of the greatest scientists that the world has ever seen, apply most forcibly—"By scientific data I do not merely mean the truths of physical, mathematical or logical science, but those of moral and metaphysical science. For by science, I understand all knowledge which rests upon evidence and reasoning of a like character to that which claims our assent to ordinary scientific propositions. And if any one is able to make good the assertion that his theology rests upon valid evidence and sound reasoning, then it appears to me that such theology will take its place as a part of science" (Thos. H. Huxley). At the very outset, therefore, we make no apologies for the psychological and theological aspects of the argument which is about to follow. The very character of human Evolution being, as it is, mainly concerned with the *mind* of man—being mainly the development of his *intellectual, aesthetic, and moral* powers—in short, being primarily concerned with the development of his personality rather than his body—is one that can only be scientifically approached from the standpoints of psychology, philosophy and religion. How then do these sciences enable us to approach the solution of the problem?

That the evolution of civilized society has been, on the whole, a movement away from the sensual and the animal into the rational, the artistic, and the spiritual, is generally conceded; but as we have just said the factors which operate in this process, and the underlying causes which determine it, are very imperfectly understood. It is commonly assumed that the civilized state is an achievement of the will and intellect of man *alone;* that progress in knowledge and understanding of the "Laws of

Nature"—a progress which is in itself initiated by the voluntary effort of man—are the sole factors concerned. In short, it is commonly assumed that civilization is the product of the human will and intellect in signal victory over the opposing forces of an unfavorable environment, and the mere sensual or fleshly instincts which would hold man down to the animal level. That this interpretation of the matter contains an important truth, is unquestionable; but that it is, in itself alone, the whole explanation of the problem, is altogether erroneous. Mere will power and intellect can never explain the enigma; for even where the will is continuously exerted in learning, and man grows daily in knowledge and understanding of the world, the results of such so-called education are invariably utilized by him for the satisfaction of his own selfish ends and purposes. What we mean to say is that man—"the natural man"—as the scriptures call him, is by nature selfish and self-centred, and only values knowledge and understanding as a means by which he can the better realize his selfish interests and satisfy his innate sensual desires. He has no primary interest in the welfare of others—in the ideals of altruism and social betterment—except in so far as these things may appear from time to time to react to his own personal benefit—a result which, paradoxical as it is, not infrequently occurs. The upshot of the whole matter is that unless man can, in some way, be induced to use the knowledge so acquired for the highest good of the race (which is only another way of saying "for the realization of the ideal goal of human development") all his education will be fruitless. "Knowledge is power," indeed, but for that very reason it must not be allowed to run riot—it must be harnessed and directed for the ultimate good of the race—otherwise it becomes a menace to civilization. Put in another way, we may say that knowledge in the hands of unprincipled and unscrupulous men is not a blessing but a curse. It destroys the very culture and civilization it is intended to upbuild. The natural conclusion to which we are led, then, is manifest, *viz*: *Character* and not *knowledge* is the real end of education; and failure to recognize this simple truth is the prime fallacy of our modern system of education. To develop the intellects but not the characters of men, to fill their minds with knowledge and understanding, while neglecting altogether to discipline their wills in obedience to moral ideals—as our colleges and universities are doing everywhere to-day—is simply to turn out expert criminals, scientifically trained crooks and outlaws; a fact which every newspaper will attest is amply corroborated by the existent state of American society. "Look a little deeper," says Matthew Arnold, "and you will see that one strain runs through it all: nations and men, whoever is shipwrecked, is shipwrecked on conduct".* In a word, it is not knowledge that insures progress and civilization, but character, conduct. Hence it is the building of character—*i. e.* a perfect personality—that is the purpose of life. Knowledge without godliness is vain. This, after all, is the real meaning of "the fall" of man. Not that he has not vastly increased in knowledge since his first appearance on earth. On the contrary he has been eating of "the tree of knowledge of good and evil" from the very beginning. But while he has eaten of this tree—"the Tree of the Knowledge of good and evil"—he has refused to eat of that other Tree "in the midst of the garden"—*viz*: "the Tree of Life"; and thus while he has grown in mere knowledge and understanding, he has correspondingly degenerated in character and spirituality of life; with the result that all his learning goes for nothing. All his effort to solve the enigma of life and its meaning have been fruitless, and he continues to this hour to wander on in darkness and misery, ever learning, but never able to come to a real *knowledge* of the truth.

Now there is nothing more certain, nay, well nigh self-evident, than this fact, and it is the glory of ancient Israel that she was the first to discover, and to proclaim to the world, the true Law of Social Evolution. As Matthew Arnold has further, and so convincingly pointed out, the prophets of Israel were the first to see clearly that despite the chaos of conflicting aims and interests in which the energies of men were dissipated, there was an "Over-ruling Power" that dictated the final course of human history—the "Power not ourselves that makes for righteousness." Men might ignore It or defy It as they pleased,

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***Literature and Dogma*, pp. 316, 317.

but always, in the end, this Spirit of Jehovah prevailed. In short, "they foresaw and foretold the inevitable triumph of righteousness," for they were the first to see clearly that this "Divine Power"—(for so they regarded it)—was more and more "incarnating" Himself in the lives of men, and that ultimately (in spite of all resistance) the dream would be realized —His complete embodiment or "Incarnation" would be effected, and that "Righteousness would cover the earth as the waters cover the sea." In a word, it was the glory of the Hebrew prophets that they were the first to discover the fact (though they never, of course, understood its full scientific import) that a great "emergence" was impending in human history —that ordinary human Evolution (as we would say) developing continuously according to its natural law (*i. e.* in obedience to its characteristic "Logos") could never attain the end for which it inwardly yearned; but that nevertheless there was an "Over-ruling Power" in history—"a Power *not* ourselves," but altogether "above" or "transcendental" to our humanity that was (in spite of all human opposition) slowly but surely working immanently, and gradually *transforming* our nature—that this Power was omnipotent, and that one day, He would effect a complete transformation—yea, one day He would become completely *"incarnate" in human flesh.*

Now it is this priceless discovery, made centuries ago, that this modern world with all its scientific pretensions has never really grasped, and needs most of all to know. As stated elsewhere, we can see more or less clearly how life became incarnate in inorganic nature; how mind (anima) became incarnate in plant nature; how spirit (self-determining human will) became incarnate in animal nature but we are slow to take in the significant fact that, in precisely the same manner, the Divine Spirit—the Spirit of Righteousness—has for ages been slowly effecting a like incarnation in our human nature—nay, has actually attained to such embodiment in the Person of a single Individual through whom as "Mediator" the complete regeneration of all mankind must inevitably be realized.

But we must not think that this identification of the Spirit of Righteousness with the Spirit of Cosmic Development itself was an idea peculiar to the people of Israel, although as already stated, they were the first to discover it.

Immanuel Kant in his treatment of the Categorical Imperative, as well as a number of other philosophical writers, have carried the discussion of the matter much farther, and there can be little doubt that what is ordinarily called the sense of duty or moral obligation which man, and man alone experiences, is nothing but his consciousness of this "*developmental urge*" within him—the impelling power of the cosmic Spirit Himself urging him onward to the realization of his highest destiny. An animal must obey this instinct or pressure to develop, mechanically and necessarily, hence must develop in accordance with the Law of Nature, but with man the case is different—at least so far as it pertains to his higher intellectual and distinctively human nature. Nothing can *compel* him to obey these instincts of his higher evolution. He simply feels their power within him urging, persuading, demanding, but never actually compelling such obedience. Hence, what is *mechanical* necessity to the plant or animal, is *moral* necessity only to man—what a lower creature *must* obey, because he cannot resist, man feels only that he *ought* to obey, though ever conscious that he can resist; but in both cases (and this is the point we here desire to emphasize) these "instincts" or "urges" are nothing more or less than the impelling power of the Cosmic Spirit Himself working immanently in the lives of all His creatures as He carries on the development of all things. Not only then does man rightly interpret this "Power that makes for righteousness" as identical with the Power that shapes the course of Nature to its predestined goal, but he likewise rightly interprets Its "Categorical Imperative" as a stern command to him individually to develop—yea, to develop all that is now latent or potential only in his self or personality *ad infinitum*—*i. e.* until he attains to the measure of the stature of a perfect man. In a word, the whole meaning of human Evolution, as seen by the Christian is the infinite development of *personality*, and the obvious goal of such a process is the actualization or "embodiment" of perfect manhood—*i. e.* the *Christ Ideal.*

So much then for the purely ethical aspect of the matter which is the one most commonly entertained by religious people. But the scientific approach to the problem fully corroborates this conclusion of the religious consciousness.

THE GOAL OF COSMIC DEVELOPMENT

We have already referred to that unusually lucid and suggestive outline of the World-Process and its culmination, which was set forth by LeConte in his well known work—*Evolution and its Relation to Religious Thought.*

As the result of purely scientific considerations this great geologist was driven to the conclusion that the cosmic process must be interpreted as a progressive series of more and more comprehensive "individuations" of the Divine Energy—each succeeding "individuation" of a higher order than its predecessor, and all converging to a logically implied goal—*viz*:—the complete "individuation" or "embodiment" of the Divine Being Himself. When it is borne in mind that LeConte regards this Divine Being as Absolute Personality*, it is obvious that this is equivalent to saying that the final "individuation" or "embodiment" is synonymous with the "incarnation" of the Divine Personality—the World-Reason—or "Logos". "Divine, Omnipresent Energy," says he, "has taken on successively higher and higher forms in the course of cosmic time. Now this movement has been wholly by increasing individuation, not only of matter, but of force. This universal, Divine Energy, in a generalized condition, unindividuated, diffused, pervading all nature, is what we call physical and chemical force.

"The same Energy in higher form individuating matter, and itself individuated, but only very imperfectly, is what we call the life-force of plants.

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*See pp. 338-342.

"The same Energy more fully individuating matter, and still more fully individuated, but not completely, we call the *anima* of animals. This anima or animal soul, as time went on, was individuated more and more until it resembled and foreshadowed the spirit of man.

"According to this view, the Vital Principle of plants and the anima of animals, are but different stages of the development of Spirit in the womb of Nature: in man at last it came to birth."*

But LeConte does not stop here. He goes on to show, as we have just stated, that the evolution of man is concerned with the development of character (personality)—that "in human Evolution character is *transformed by its own ideal*"—and that this ideal character is synonymous with absolute Personality or Godhood. In a word, he shows that, in the very nature of the case, the evolution of man can have no goal short of actual unity with the Divine Being—that perfect Manhood is Godhood—that human nature developed *ad infinitum* (*i. e.* to its limit of perfection) is one with the Divine Nature, and so is synonymous with the vision of "the Christ" or "GOD-MAN". "As organic Evolution reached its goal and completion in man," says he, "so human Evolution must reach its goal and completion in the ideal Man—*i. e. the Christ.* According to this view, the Christ is the Ideal Man, and, therefore, (*mark the necessary implication*) the Divine Man."§

Now it is this last statement that brings us to the crux of the whole matter. Not only does LeConte assert that organic Evolution finds its goal and completion in man, but he goes further and asserts that human Evolution, in turn, must of necessity find its goal in the Ideal Man who, he declares, is, simultaneously, the Divine Man—hence the God-Man. In short, he distinctly asserts that the goal to which the whole cosmic process, with man at its head, is tending is no other than that which Christianity has been holding before the minds of men for nineteen centuries in the vision of the "God-Man"—the *Christ Ideal.*

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*Id. pp. 318, 319.
§*Id.* p. 360 *et seq.*

Moreover, he states this not as a more or less probable hypothesis, but as "the necessary implication" of the whole cosmic process itself.

To appreciate the full significance of this remarkable statement, however, it will be necessary that we clearly understand the true nature of these successive "individuations" of the cosmic energy of which Le Conte is speaking. He is here referring to what to-day are commonly called the successive "emergences" of life, soul (*i. e. anima*), and personality; or—if we prefer to consider them from the strictly biological point of view—the successive "emergences" of plant, animal, and man. It is generally agreed that every such emergence is also to be considered as a "new synthesis"—*i. e.* a new whole, integral, or "rational unity" of potentials—and it is obvious that this is equivalent to what LeConte calls *a new individuation of energy*—in short, a new individuality. What is not so plain to those who otherwise might readily accept this interpretation, is the further significant fact that every such "individuation" or "individual" is also a *rational* unity—that is a *specific embodiment of that rational principle which rules everywhere in Nature—hence an embodied reason or mind;* and as each successive "individuation" is a more comprehensive and complete expression of reason—a higher order of mind than its predecessor—their chronological appearance in the process of cosmic Evolution indicates that this latter process is one which is concerned with the progressive "embodiment" or "incarnation" of the Absolute Reason of the cosmos. In short, the whole cosmic process itself implies that the End or Goal to which it is tending is the final, complete expression of its own Logos or rational principle—hence the complete embodiment of the World-Reason, or—as the theologian expresses it—the complete "incarnation" of the Divine Logos.

We do not say, of course, that all this is distinctly asserted in the foregoing statement of LeConte, but only that this is the logical implication of his argument. Unfortunately, the great geologist never went into an exhaustive discussion of the subject, and has left us in doubt as to his attitude toward a number of problems which naturally suggest themselves, but the main idea is clear. He is thoroughly convinced, as an Evolutionist, that the end toward which the entire universe is moving (with man at its head) is the final "embodiment" of the World-Reason, and he has taken care to point out that such a consummation is identical with that vision of the ultimate embodiment or "incarnation" of the Divine Logos which Christianity for centuries has declared to be the

> "one far-off divine event
> To which the whole creation moves."

Nor does he stand alone in this interpretation of the matter. It is most significant that writers of many other schools have expressed substantially the same opinion. Indeed, it may be stated that practically all forms of Idealism that interpret the universe as the manifestation of a Supreme Mind or Intelligence, operating according to the characteristic principle of all mental activity (reason) are committed to the conclusion that the cosmic process is a rational movement having for its goal the complete expression or "embodiment" of this rational principle in material form. "The process of the world," observes Prof. Joseph A. Leighton, "is the ever-increasing manifestation and realization of the Absolute Mind"* and this conclusion, in one form or another, constitutes the central idea in many systems of philosophy past and present.

But interesting as is this argument of LeConte, and thoroughly scientific as we believe it to be, it is no more convincing than that which the psychologist has to present.

THE GOAL OF PSYCHOLOGICAL DEVELOPMENT

The initial fact to be observed here is the spiritual rather than the material character of all higher human evolution. All higher human development is primarily an intellectual, aesthetic, and moral advance wrought by the will under the motivation of "ideas" and "ideals"—an advance in education, civilization,

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***The Field of Philosophy*, p. 405.

and culture. It is not without its physical accompaniments of course, but these are of the nature of effects—not causes. These latter phenomena are peculiarly manifest in the ever increasing organization of the brain (the "thought-mechanisms" of Broca *et al.*), and the numberless material inventions and devices peculiar to civilized life. "So far as crude living is concerned," observes Prof. Sandiford, "the lower arcs of the central nervous system are all that are necessary. Compared with these fundamental arcs, *those formed by education within the walls of the schoolroom seem of little consequence.* But with man's evolving nature the lower arcs become inadequate. The brain with its thousands of upper arcs, grows, develops, and becomes functional. The 'learning brain' contrasted with the 'living spinal cord' thus puts us in intimate relation with the great world of knowledge we call civilization. Man's abundance of connectible neurons, therefore, makes him human. .*It is training and education that lead to the higher and more complex neuron connections, and place man far above the level of the beast.*"*

Civilization, then, is the effect of education, but education, in turn, is the result of the progressive organization of the brain carried on by the will under *the constant "motivation" of ideas and ideals;* so that in the end all that we call civilization—all the intellectual, artistic, moral and spiritual evolution of the race is, as we have said, wrought by the will of man in response to the motivation of ideas and ideals.

But once this is clearly understood—once it is fully realized that all higher human advance is determined by "ideas" and "ideals"—then it becomes obvious that the successful completion of our higher development is wholly dependent upon the discovery of the supreme ideal of life—that is to say upon the discovery of that ideal which, by its very nature, is seen to be the logical and necessary implication of all lower or subordinate ideals. Man, indeed, pursues many ends, and attempts the realization of many objects here in this world, each of which is represented in imagination as an "ideal" to be attained; but

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**Educational Psychology*, p. 115. *Italics ours.*

only a little reflection should easily convince us that there can be, in the very nature, of things, but one ideal which represents the logical and necessary goal of human development. To discover that particular ideal, then,—the supreme end and purpose of life—is the great problem to be solved. Can this ideal be discovered; and if so, what is its nature? Now, in a general way, this question has already been answered and should be obvious. The real end of life is not the attainment of any particular object, the satisfaction of any particular desire, or the realization of any one of the numberless ambitions that absorb our attention from time to time—but, as the psychologist expresses it, the ultimate goal is *self realization*—the realization of all that is potential in the self—the actualization of all that is as yet unactualized in our personality—in short, the supreme ideal in life is the attainment of a *completely developed personality.*

To make the truth of this statement appear yet more plainly, we may quote the following remarks of Prof. Dewey. In dealing with this subject, he likewise tells us that there are, of course, many diverse motives that impel the will to action—hence many relative ends which men seek to attain, but that after all "it is evident. . . .that ultimately there can be only one end to human action. All other ends are proximate ends. . .Each end is referable to a higher end, which stated in most general form is *self-realization.* . . .The end of every desire and choice, in other words, is the self. . . .It is evident, therefore, will can find its goal only in the completely realized self. It can find its goal, in other words, only in itself. Till the will is completely real, that is, until the whole self has become objective and universal, will must have an end toward which it cannot cease striving. It can find the goal only when the actual and the ideal self are one. . .It is the essence of the will to objectify or realize itself. It always holds up its objective or real self, therefore, as the end of all action, into which the given self must be transformed."* Again, "The self has always presented to its actual condition the vague ideal of a completely universal self by

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**Psychology*, pp. 370-373.

which it measures itself, and feels its limitations. The self in its true nature is universal and objective. The actual self is largely particular and unrealized."*

Translated into plain English, this means that the goal to be attained is simply the vision of the finite, actual self developed *ad infinitum*—that is to say, to its "limit" in the infinite, ideal, self. In short, the particular self must grow until it becomes one with the universal self—the finite human will must develop until it is one with the infinite, divine will—the finite, human reason must grow until it attains to complete unity with the infinite, divine reason ("World-Reason"). In a word, manhood developed *ad infinitum* (to its *limit*) is seen to be synonymous with Godhood; hence the goal to be attained is that which is presented to the imagination in the "vision" of manhood and Godhood united *i. e.* The vision of the *God-Man.*

We arrive, then, at the most important conclusion that the goal of cosmic development, and the goal of human psychological development are one and the same, and that both are identical, in turn, with that "vision" or ideal which Christianity has ever set before the world as the end and consummation of all things—the vision of the World-Reason or Absolute Personality incarnate—*God manifest in the flesh.*

But if all this be so, it must be evident that a number of most important consequences follow respecting the character of Jesus of Nazareth, and the unique position which he occupies in human history. For if it be true, as the psychologists tell us, that the supreme purpose of life is the building of a perfect personality—an ideal character; and if the building of such a personality is altogether the work of the will, and the will cannot voluntarily actualize this, or any other end, without first a "vision" of such end being furnished the imagination (as its guide and "motive")—it is obvious that a *"revelation"* of this ideal to the mind of man somewhere "in the course" of his development, is a necessary pre-requisite for the ultimate realization of such development. This fact was clearly recognized

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**Id.* p. 418.

by LeConte, who emphatically asserts—"This ideal must come somehow *in the course* and not at the end."*

But if this be true—if such a "vision" be an absolute prerequisite to the inauguration of this higher cycle of human development—and it can further be shown that this very "vision" has been given by Jesus of Nazareth (being no other than the vision of the God-Man of the Gospels), then it must follow as the night the day, that the historic Person—through whose instrumentality this ideal necessary to human salvation has been given to the world—is Himself, in the most literal sense, the divinely, fore-ordained SAVIOUR of the world. Let us squarely and honestly face that fact. It may indeed be true that our precise interpretation of His character and work as "Saviour" may vary, but after all is said and done, it remains a fact that in some real sense all men must admit that He is *the Saviour of Mankind.* God or Man, whoever presents the race with that ideal or "vision" whose contemplation is absolutely essential to the realization of its future life and development, *saves it from otherwise certain destruction.* That Jesus of Nazareth has accomplished this is beyond all question; for it is a simple, undeniable fact that it is to Him that we are indebted for the "revelation" of this ideal, and whosoever hath caught this "vision" of the God-Man (vision only though it be), and hath yielded himself unreservedly to its all quickening, all uplifting influence, hath already "passed from death unto life eternal"—hath, in the most literal sense, entered upon that higher, self-determined development of the soul which can have no ending short of complete unity with the Deity Himself. In short, such an one "hath everlasting life" even now within him. Moreover, only a little reflection will serve to convince us that many other titles, as well as sayings and teachings of the lowly Nazarene take on new and peculiar significance when looked at from this point of view. To begin with, inasmuch as this vision of the God-Man which He has presented for our contemplation as the goal to be actualized is the vision of manhood and Godhood united, it is simultaneously the vision of *manhood deified* and of God Himself revealed to us "in the form of man"—*i. e.*

**Evolution and Religious Thought*, pp. 363, 364.

"*God manifest in the flesh.*" It is literally true, therefore, that the "revelation" which Christ has given the world is a genuine revelation of "God Incarnate." Moreover, it is further clear that in revealing the fact that we were already potentially one with God, and that the end of our development must be to actualize this potential unity in a real embodiment of the God-Man in each individual life, He has "broken down the middle wall of partition between us" (*Ephes.* II. 14)—destroyed the hitherto universal opinion that God and man were hopelessly separated by an infinite and impassable gulf (with all the corollaries which that dark theory contained), and has, thereby, effected a true atonement—*i. e.* "*At-one-ment*"—between God and man. He becomes, therefore, the "*Mediator*" between God and man.

But even this is not all. In revealing this potentiality of man for perfect unity with God, He pointed out the further significant fact that this unity could never be actualized save under the inspiration (motivation) of the Divine Power latent in the ideal (vision) itself. Human reason was, indeed, a "seed" of the World-Reason, even as the Stoics taught—an embryonic embodiment of the Divine Logos—but even so, it could not of itself alone actualize all its potentials and develop *ad infinitum.* It could attain this end only under the guidance and the "quickening influence" of the "vision" itself. He taught, in other words, that the power to actualize the ideal lay, not in the human will or intellect, but in the objective "vision," and that it was by this "Grace" (*i. e.* the quickening influence of the ideal) that we were saved,—and not by any mere effort of our wills. In short, He made it plain that before man could enter upon this new and higher life, before he could enter into the Kingdom of God, he "must be born again," "born from above" (ἄνωϑεν), "born of *the Spirit* (*i. e.* of God)"; "born, not of blood, nor of the will of the flesh, nor of the will of man, but of God." This was the point which He emphasized, and it is a significant fact that we discover, when we come to analyze the problem from the psychological point of view, that this, and this alone, is the true explanation of any voluntary development *of the will.* The will depends upon the power latent in the idea to continue its activity—it literally feeds upon this power; and can no more hope to continue to grow and develop without this "spiritual food," than the bodily life can continue to grow and develop without its "material food." All this, or course, was further symbolized by the church in the sacrament of the Holy Communion. We might go on indefinitely to point the meaning of numberless facts and doctrines associated with the Christ of the Gospels which take on new meaning, or compel admission of their strictly rational and scientific nature, when looked at from this point of view. A little reflection immediately acquaints us with the significance of such titles as "Immanuel" (*"God with us"*); Redeemer; the "Light of the world"; or "the Light which lighteneth every man coming into the world." As the progenitor of a new type or species of man, we can easily understand His title of the "Second Adam" in opposition to the "First Adam". He is, indeed, the "Second Adam" or "New Man"; "Born from above"—of the Spirit, and not of the flesh: —the "Head" of a new race or type of man—the "spiritual" as opposed to the "natural" man. We can readily understand how it follows that "as in Adam all die, even so in Christ shall all be made alive"; for all who accept the "vision" which He presents to their imagination are, in the most literal sense, "quickened" by the power latent in that vision—("the Power from on High") into "a new life"; "begotten" in a "new birth" into a sphere of everlasting progress or development.

In short, it is simply impossible to deny that in some real sense, the Supreme Power that has created the world, and who is now and ever carrying on the cosmic process to a foreordained goal, has "revealed"—yea, "manifested" Himself and His ultimate purpose to the world in Jesus of Nazareth, and has through Him as the "medium" or, as we are accustomed to say, as the "Mediator," "opened the way unto everlasting life" for all mankind—inaugurated a new cycle of "spiritual" as opposed to "natural" development; in short, started humanity upon a new, and everlasting course of intellectual and moral development that can have no consummation short of our complete self-realization in God, the complete unity of God and man in the actualized vision of the *God-Man* of the Incarnation.

But in spite of the obvious character of these conclusions, we are quite aware that certain objections will be urged against them. It will be contended by many thoughtful and conscientious Christians that we have here stressed the Ideal Man or "vision" which Christ presented to the imagination of His disciples more than the actual experience of *His own sensible bodily presence, visible to their fleshly eyes.* That we are tending to make more of a "vision" present to the imagination alone; than of a flesh and blood experience—of a Christ visible to the mind's eye, rather than of a Christ visible in bodily form to the senses of the disciples. But, after all, is this a valid objection? Even admitting, as we do, the literal, historic Christ; is it true that the *sensible* experience of such a Person, was or is the essential factor in His revelation to the world? In short, which is the Christ that "*saves*" us? Is it the Christ discerned with the eyes of the flesh? Or is it the Christ who can only be discerned by the eyes of the spirit? Is it not true that numbers who saw Christ with the eye of the flesh, failed utterly to perceive the Deity that was in Him; while thousands who never saw Him "in the flesh," have nevertheless become convinced of His Divinity simply through the "vision" present to the imagination? It is not flesh and blood that reveals the mystery of the Incarnation. "No man hath seen God (*i. e.* with the fleshly eye) at any time"; it is the spiritual eye which alone beholds Him. Even when Christ was actually incarnate in a human body, visible to the eyes of His disciples, it was not the natural but the spiritual eyes of the disciples that discerned His Deity. Indeed, this is the whole meaning of those memorable words of the Saviour uttered in response to the first recognition of His Divinity—"Blessed art thou, Simon Bar-Jona: *for flesh and blood hath not revealed it unto thee, but my Father which is in heaven.*" It is not any sense-perception, therefore, that saves us, but a "vision," an "idea," or an "ideal" of the mind. Nor is there anything strange in such a statement. For, after all, the Christ which every Christian man to-day worships, is certainly not a Christ that is actually visible to his fleshly eye, but a "vision" present to the imagination alone. It is an *ideal* Christ—an ideal character—present to his mind's eye alone that is the object of his adoration. But, nevertheless, though an *ideal* only—a "vision" of the imagination alone, and not a sensuous perception; it is a vision that is capable of filling him with omnipotent power and inspiration—with infinite hope and courage, with eternal love and bliss and joy unspeakable—yea, an ideal that can actually transform his character, inspire an eternal development of his soul, and lift him to an altogether new plane of experience. In short, the Christ presented for our contemplation in the Gospels is for us (at any rate) an "idea" only—a "vision" of the imagination alone—yet by feeding on that Ideal Man in our hearts by faith, by gazing intently on that vision (vision only though it be), we find ourselves transfigured, yea, transformed into His Divine Image, and drawn forever upward and onward in an unending life of intellectual and spiritual development. It is not necessary for us, therefore, to *see* Jesus in the flesh in order to be saved, and, as an actual matter of fact, only the merest handful of earth's millions have had that privilege accorded them. It is the *ideal* Christ present to the mind, the "vision" of the imagination alone, that has saved, and is even now in process of saving, countless millions of human souls.

In short, this whole objection is based upon the same general misunderstanding of the problem of human development to which we alluded at the beginning of this chapter. As there pointed out, to assume that higher human evolution is primarily determined by sensuous impulses and physical stimuli, is to miss the very essence of the problem. Unlike plant and animal evolution, higher human development is a process carried on by the will under the motivation of ideas and ideals alone. It is essentially a *psychological* process; and in saying that, we are in no sense diminishing its reality, *for ideals are themselves realities.* Indeed, they are the only abiding realities. Physical things are transient; ideals are permanent. "The things that are seen are temporal." It is "the things which are not seen" that are "eternal." The whole higher evolution of man, therefore, and the whole "revelation" of Christ concerning it, is built on the reality of ideals. While we are far from denying, therefore, that Christ was visibly present to his disciples while on earth, we nevertheless repeat, it was not the vision of his body, but the vision of his character with which his disciples were primarily concerned—it was the Christ visible to the eye of faith and reason—not the Christ visible to the eye of sense.

Let us repeat, then, once for all—it is the "vision" or "ideal" of Perfect Manhood—completely developed Personality—as the final goal of all human evolution that is the really essential factor in Christ's revelation; and had He given the world nothing more than this—the vision of the *God-Man* as the End of all our striving—he would still be the SAVIOUR OF THE WORLD.

CHAPTER XV

Christ—The Ideal Personality

ARE we then to infer, from what has just been said in the preceding chapter, that the Christ whom the Church asks us to believe in is a "vision" of the mind only, and never actually lived "in the flesh"? Are we to assume that Jesus of Nazareth—Himself a man only—merely succeeded in impressing the minds of His disciples with a vision of the ideal to be attained, but was never Himself the actual embodiment of that ideal which he so revealed?

In answering that question we arrive at the crux of the whole discussion. In what real sense are we to understand that God was manifest in Christ? Is the picture of the God-Man presented us in the New Testament the picture of an actual historic individual, or is it only the picture of an Ideal Man whom Jesus of Nazareth depicted in His teaching, and ever held before the imagination of His disciples for their contemplation as the abiding "motive" and "inspiration" of their eternal development? This has always been the crucial problem of the incarnation, upon which great differences of opinion have been expressed. That the ideal of the God-Man is the supreme goal of human evolution cannot be questioned; and that Jesus of Nazareth revealed that ideal to the world, and further explained to us its meaning and importance, is likewise unquestionable. But how did He reveal that ideal? In His teaching and doctrine *only*, or in his actual Person and Character? Did He present it as a "vision" to the imagination only; or did He actually "incarnate" it in His own Person and Character? As LeConte well expresses it, such an ideal, being absolutely essential for the higher development of the race, must be revealed to the consciousness of man, some how, some way before the end can be attained, but "*whether in the imagination or in the flesh, I say not.*"

Let us clearly understand the issue, then, at the very outset—let us clearly perceive that in one sense the essential importance of the Christian "revelation" remains the same, whichever interpretation of the matter, we choose to take.

That is to say, we know, from the conditions surrounding the problem, that the vision of the goal to be attained in human evolution must be "revealed" to the mind of man before it is possible for him to realize it—we know also from the essential conditions of the problem that this goal, when presented, will be that very ideal which we speak of as the vision of the God-Man—we know, further that this ideal *has* been revealed to the consciousness of the race, and that this "revelation"—so absolutely essential to the realization of our higher development—has come through Jesus of Nazareth; so that from *any* point of view it must be candidly admitted that He (Jesus of Nazareth) is "the Saviour of the world"; yet after all this is freely conceded, the same men that accept this conclusion, may differ among themselves in regard to the precise manner in which this "revelation" was effected—especially as regards the specific relation of the *Person* of the Christ to the *ideal* which He presented.

It is one thing to say that it was through the instrumentality of Christ that the world was brought to behold the Divine Logos as its predestined goal—one thing to say that (in the most literal sense) He made known or "revealed" this Divine Logos to men, but quite another thing to say that He was, in His own *Person,* that God, or Divine Logos, whom He so revealed. To admit that either Socrates or Moses, through his teaching, revealed or manifested God to the world, is not to admit necessarily that either Socrates or Moses was a genuine incarnation of God. While, therefore, in His teaching and doctrine it may be said with perfect truth that Christ "revealed" or "manifested" God to man, it does not necessarily follow from such a statement, that He was the "incarnation" (in His own Person) of that God whom He so revealed. In short, we must distinguish between the revelation of truth which a man may impart to the world through his *teaching or philosophy* of life, and that revelation which a man may give us in his own *person and character*. That Christ through His teaching, revealed to us the meaning of life—showed us the goal toward which the universe, with man at its head, was predestined to develop—even pointing out that this ideal was, simultaneously, the vision of God, and of man infinitely developed—hence the vision of *God manifest in the flesh*—the vision of the *God-Man*—all this can be demonstrated, and as a result of such demonstration it can be truly affirmed, in one very real sense, that "God was manifest in Christ". But after all is said and done, this genuine revelation of God through Christ (*i. e.* by means of His teaching) must not be confounded with any alleged revelation of God in the actual Person of Christ. He may have truly shown God to us in His teaching, without ever having shown God to us in His personal character. But, it is well known, that the orthodox view emphatically asserts the reality of this last mode of divine manifestation. God was not merely manifest in Christ's doctrine and teaching, but in His life and character—in short, He was, in His own Person, a literal incarnation of Deity. The question naturally arises, therefore, can such an assumption be justified in reason? Have we any rational evidence as to the truth of this proposition?

Now, strange as it may seem at first sight, the evidence in support of this well known doctrine of the Church, is not so remote as many are inclined to imagine. The evidence is, of course, psychological (as is the whole problem), and must be treated from the point of view of that science.

Reduced to its lowest terms, the problem comes to this:—it is granted that a man, through his reason and intelligence, may "reveal" God to others; but is it possible for a man in his own person and character to "reveal" or "manifest" God to other men? The answer to that question is an emphatic affirmative. Every man, however lowly, who in a moment of inspiration rises to the sublime heights of an infinite courage or an infinite love is (for the moment at least) a veritable "embodiment" or "incarnation" of that Divine Power or Spirit which takes possession of him. There is nothing more certain than this self-evident fact. In short, we have only to remember that love itself is the Divine Spirit—that "God *IS* Love" (*i. e. love* and *God* are but two names for the same reality) and it follows inevitably that any man who wills and acts under the impulsion or inspiration of that Divine Power is (for the time being, we repeat) a genuine incarnation of the same in his own person. *In his own person,* we say; for be it remembered that love (in the true sense) is not a mere passive feeling or affection, as so many people imagine, but an *active volition*—an act of the will; and since the will, in turn, is the true person or ego, "good will" or "love" is a manifestation of God in the will or person—hence, God incarnate in the man. In short, we may throw the whole argument into the following series of propositions. The will constitutes the true ego or person in every man. But will acting through reason for the realization of the good—in other words, *good will*—is only another name for *love,* and love, in turn, is only another name for *God.* "God *IS* love; and (consequently) whosoever dwelleth in love dwelleth in God, and God in him". In other words, God is *in* him—"incarnate" in him. This again is what is meant by the saying—"whosoever are led by the Spirit of God, they are the sons of God." To have the Spirit of God incarnate in you, is to be a son of God —to have the life of God in you. While, then, it is true that a man may manifest God to the world in his teaching, without in any sense being himself an incarnation of God; it is also true that he may manifest God in his own person and character; and to the extent that he does so, *he is a literal embodiment or incarnation of Deity.* Now it is gratifying to know that LeConte also recognizes this profound truth in relation to the Christ. He writes—"It is not necessary that the Ideal Man—the Christ—should be perfect in knowledge or in power; on the contrary, he must grow in wisdom and in stature, like other men; but he must be perfect in character. *Character is essential Spirit.* All else, even knowledge, is only environment for its culture. In the dazzling light of modern science we are apt to forget this. Character is the attitude of the human spirit toward the Divine

Spirit. If I should add anything to this definition, I would say it is spiritual *attitude* and spiritual *energy*. In the Christ this attitude must be wholly right; the harmony—the union with the Divine—must be perfect. This perfect union gives, of necessity, also fullness of spiritual energy."*

The proof, then, of Christ's Divinity does not lie primarily in His *teaching* but in His *character*—in the nature of "the Spirit" which He ever manifested to those who knew Him, and which, as He expressly affirms, He has left the world as a "Witness" to the truth of His claim. "No one speaking by the Spirit of God, calleth Jesus accurst, and no one can say that Jesus is the Lord but by the Holy Ghost"—that is to say, but by this selfsame Spirit. What He means to say, and what every one can know for himself, is that the experience of that Holy Spirit is itself the experience of a Divine Power—is itself the experience of God. It is not necessary to attempt to prove this by any logical process—the experience itself is sufficient proof. To feel that Spirit (love) in our own hearts, is to feel God Himself in us. It is to be literally "alive in God," and to have "God alive in us." No man who has ever experienced love in his heart, has ever questioned its Divinity. Nor is it the prophet alone who testifies to this fact. Every poet, every artist, every musician has felt this mystic Power within his soul, taking possession of his very personality, inspiring him with superhuman energy, and sweeping him onward and upward to the accomplishment of superhuman tasks. But while numbers in all the walks of life, have known its power, it is only Christ, and those enlightened by the "revelation" He has made concerning it, that appreciate its real character—that understand that it is *God Himself in us—God incarnate in us—God Himself working in us both to will and to do of His good pleasure.*

The "revelation" of Christ, then, was not simply the "revelation" of an "idea" or "ideal" to the imagination, *but the actualization of that ideal in a life or character*, which all men might behold. That is to say, Christ not only taught us that the end to be attained was the embodiment of a Perfect Personality

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**Id.* pp. 360, 361.

(which "Perfect Man" each might picture in imagination) but He proceeded to show us what such a Perfect Personality was, by actualizing it in a life or character of love, which love, in turn, had only to be "felt" that its Divinity might be known. The experience of love is itself the experience of Divine Power. To feel the love of Christ therefore is itself to feel the Divinity of Christ—to feel the God in His character—to feel that He is a true embodiment of God—in short, to feel directly that He is God Incarnate.

To analyze the psychological aspect of the problem still further, let us revert once more to the principle elucidated by Dewey and other psychologists, that the goal of the self's development is the building of an Ideal Self—a perfect personality. Now the building of such a perfect personality is to be wrought by the activity of the will carried on persistently under the motivation of the *supreme rational ideal;* and since will thus working through reason results in the complete harmonization (rationalization) of all acts and experiences, the final expression of the whole process is that "spirit" of perfect "unity and concord" of the entire personality which we speak of as the "the Spirit of Holiness" or "the Holy Spirit"—the Spirit of the Good, the Beautiful and the True. "As it takes the nature of a universal harmony of truths," says Dewey, "it is the intellectual ideal; as the universal harmony of feelings, it is the aesthetic; as the universal harmony of volitions, it is the moral."* But this is only another way of saying that, as it takes the form of the harmony of truths ("intellectual ideal") it is "the Spirit of Truth"; as it takes the form of the harmony of feelings ("aesthetic ideal"), it is the Spirit of the Beautiful; as it takes the form of the harmony of volitions ("the moral ideal"), it is the Spirit of the Good—the Spirit of Righteousness—"the Holy Spirit"—the Spirit of Love or "Good Will". Inasmuch, however, as all three of these "modes" (intellectual, aesthetic, and moral) are seen, in the last analysis, to be so many aspects of will working through reason for the complete harmonization, well-being, or "good" (integrity) of the entire personality, we

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***Psychology*, p. 424.

sum up the matter by saying that a perfect character is the expression of *will* working through *reason* in *the spirit of the good—i. e. the spirit of love and good will.*

Now, it is because Christ not only revealed God to us in His teaching or doctrine, but even revealed God to us in His *life* and *character,* that the world has come to regard Him as more than an ordinary human prophet. In His very character, in his very Person, the Divine Spirit was manifested. Hence, in His very Person God was revealed, and seen to be manifest in the flesh.

Marvellous as was the teaching of Christ to those who listened to his words, yet more marvellous still was his Personality. He made men understand the nature and purpose of God through His teaching, indeed; but—more than that—He made them feel the actual presence of God in His life and Person.

But, even admitting all this—even admitting that the presence of the Divine Spirit in the life of any man is incontestable evidence that God is in him, and that thus, in some sense, he is a genuine incarnation of Deity—how are we going to distinguish Christ from any other godly man? "All who are led by the Spirit of God are the sons of God"—*i. e.* have the life of God in them, and so are genuine incarnations of Deity. Even granting, therefore, that Christ gave us an example of Divine Sonship such as no one before or since has ever given the world—even then is it not true that He differs from other spiritually minded men *in degree* only, and not *in kind?* Why assume that, unlike all others, he is "God of God"—"Creator of the World,"—*etc.* This is a pertinent question, and it must be candidly admitted that if we had no other evidence than that furnished by his character (marvellous as that character was) we could not make this affirmation with certitude. Such a character would indeed assure us that God was incarnate in Him, but it could not assure us that He was the Second Person of the Trinity, the Divine Logos, who framed the universe, who was in the beginning with God, and who was God.

To understand the rational grounds which support this last and most astounding assumption—our belief in His actual

Divinity—we must go beyond the circumstantial evidence just presented (which strong as it is, merely implies the probability of such a conclusion), and consider the evidence which comes to us from quite another quarter. It is only when we see Christ as *the logically last emergence of cosmic development*, that we begin to see the meaning of this claim. For, first of all, if He be a true emergence at all, like all other emergences, He must be the manifestation of a Power "from above" or transcendental to the plane of the development upon which He operates, which, in this case, means that He must be the manifestation of a *super-human Power*. That is to say, if his appearance constitutes a true emergence in human history, He cannot be conceived as a mere man—that is, He cannot be accounted for as the product of ordinary human generation, but his appearance must be explained as the product of super-human, Divine Energy descending into our nature "from on High". He must be born "*from* above" (ἄνωϑεν), not "from below"; born "not of blood, nor of the will of the flesh, nor of the will of man, but of God." In saying this, we are making no claim for Christ that we would not make for any and every emergence. A genuine emergence is never the natural product of the development in which it appears; but is always the manifestation of a Power above or transcendental thereto—a Power which descends into the germ plasm of such development, and re-arranges its potentials into a "new synthesis" (whence the parthenogenesis of a new type). This has been so exhaustively explained elsewhere, that there is no occasion for further discussion of the matter. It is necessary, however, to stress the peculiar significance of the principle in the case of Christ's appearance. It means that if we have any reason to believe that the appearance of Christ, and the new era of higher human intellectual and spiritual development which He has inaugurated, constitute an emergence *at all* (a proposition which it will be difficult for any one to deny), then, on the basis of that fact alone, it follows that He is necessarily (in His own Person) the manifestation of a super-human Power—in fact, the incarnation of that very Divine Spirit that He has infused into the lives of men.

In the second place (and as affording supplementary evidence for the above) the character of the developmental movement which He has actually inaugurated proves, upon examination, to be, in its very essence, the manifestation of a Divine Power, and to have no logical end or limit short of the complete embodiment or "incarnation" of that Divine Power "in the flesh". In a word, it is a "movement" which, unlike the product of all previous emergences, is infinite in potentiality—a germ whose full, mature expression is logically and necessarily synonymous with the complete embodiment of the World-Reason—the incarnation of the Divine Logos. It is Christ's own ideal and Christ's own Spirit that have initiated this new cycle in cosmic development, and since that ideal is itself *infinite*, and that Spirit which is urging all men onward to its actualization is directly experienced as a *Divine Spirit*, the entire movement is self-evidently nothing more or less than the progressive embodiment of God's own Spirit in human nature, and can have no ending short of the complete "incarnation of Deity in the flesh."

The trouble with Christian people is that they do not take their religion seriously. They are forever treating this "revelation" of the Christ as a beautiful, but nevertheless rather visionary theory. Indeed, they are disposed to ignore the theological and philosophical aspects of the creed altogether, and emphasize only its ethical and philanthropic elements. What we have to realize is that Christian theology (properly understood) is no fantastic dream of the imagination. It is a rational, scientific attempt to explain the nature of a real power already present in this world. In short, we are concerned with the direct experience of an actual power here in our midst which any man can feel and test for himself—a power which can be actually taken into our souls and actualized in our lives, in as literal a manner as the physical energy stored up in our food is assimilated and actualized anew in physical growth and development. Failure to appreciate this fact, is to miss the whole point of Christ's revelation. Just as we know that gravitation, heat, light, electricity, *etc.*, are real energies here in the world, and not mere figments of the imagination, so Christ wishes us to realize that love, the spirit of righteousness—God's own energy is also an actual power here in our midst, and can as certainly be felt and experienced as any of these other forms of energy. Moreover, just as Newton, Faraday, and others, have largely explained the nature of these "physical forces," and shown us how to utilize them for our own material profit, so has Christ explained to us the nature of this spiritual power, and has taught us how to utilize it for our own eternal good and exaltation, how to assimilate it and live by it. Christianity to-day is simply the practical carrying out of Christ's instructions—that is, the actual assimilating of this Divine Energy into our souls, and under its omnipotent, quickening influence, living, growing, and developing through eternity. But this assimilation of the Divine Power in our lives is, obviously, synonymous with *the incarnation of God Himself in our flesh;* and since this incarnating process is initiated by Christ and carried on within us through His "mediation" even unto its final consummation, He is seen to be the Alpha and Omega of the whole movement. Note especially, it is because it is through Christ Himself that the nature of this Divine Power—long present in the world, but still unknown to men—has been "revealed" to them—His quickening Spirit shed abroad in their hearts—His life infused into their lives, and so the actual incarnation of God in human nature effected:—it is because of this, that Christ, in His own Person, is seen to be the *source* or *origin* of this whole world-movement: Himself the *beginning* of the Incarnation—Himself the *embryonic embodiment* of God in human nature. God enters our human nature through Him, and He, therefore, as head of this world-movement, must of necessity be the incarnation of God in embryo.

The whole purpose of Christ's revelation, then, was *to bring the Divine Power into our midst, and make it available to man.* But, He manifests this Divine Power, not merely in His teaching, but in His character, His personality, His life. He is in His own Person, then, one with God. In a word, He Himself is God incarnate. This means again that He is "from above," not "from beneath." But this again is only what is to be expected, if his appearance is a genuine emergence. As already pointed out, in the case of every emergence that has ever taken place, the new type is ever brought into existence by a power "from above" or transcendental to the existing development; a power which descends into the germ plasm of the race, re-arranges its potentials into a "new synthesis" or "logos". If an emergence at all, then, Christ must of necessity be "from above"—that is, the expression or manifestation of "the Power from on High". And this, we repeat, is necessary also if Christ's revelation is to mean anything for us. If He is not God Himself in the flesh, he is incapable of "lifting us up" to God. Men cannot of themselves attain the goal even after the "vision" of it has been revealed to their imagination and they know what is expected of them. *Only the Divine Spirit—yea, God Himself descending to the level of man, entering into our hearts and working in our lives,* can effect the miracle. The whole teaching of Christ, therefore, is in perfect harmony with the conditions surrounding an emergence.

The necessity for man being lifted to the goal by the Divine Power "from above," because he cannot attain it by virtue of his own unaided will power—this principle of Emergence—is again the same as the principle of the "new birth". To enter that spiritual life each one of us "must be born again"—*i. e.* "from above". We must be "born anew" of this Divine Spirit. Mere flesh and blood cannot enter into the Kingdom of God." "That which is born of the flesh is flesh; that which is born of the Spirit is Spirit."

By allowing this Divine Spirit—the spirit of love—to enter into him and take possession of his soul, however, man becomes exalted into another sphere. This is the "new birth." Once entered upon this "new life," man not only forsakes all other ends and ambitions, for the realization of the one and only logical goal of higher intellectual, moral and spiritual development (the vision given him by Christ), but from now on he relies solely on the all-quickening stimulation or motivation of the Divine Power latent in that vision; in short, he no longer "trusts in himself," in the power of his own will, but altogether in the quickening of this Divine Spirit. He is now "born anew," "from above," of the Divine Spirit, which is now literally "incarnate" in him. He is now "alive in God, and God is alive in him". He no longer lives "in the flesh," but "in the spirit." He is a new type of man,—*spiritual* as opposed to *natural* man. Though dead to the flesh, he now lives in the spirit. The spirit of the "old Adam" no longer works in him; it is the spirit of the "new Adam" that now possesses him. And when at length, the whole human race shall have suffered this "transformation" or undergone this "regeneration" (new birth), the old type of man shall have passed away—the species *Homo naturalis* shall have become extinct—and the new species *Homo spiritualis* shall have taken its place forever.

We affirm, then, not as a matter of religious sentiment merely, but as a matter of rational conviction—that all the scientific evidence goes to show—

(1) That Christ and His "revelation" constitute a turning point in the history of the world—the inauguration of a new era in human development.

(2) That as the *originator* of this new order of development, and as the "*revealer*" of the conditions absolutely necessary for entrance thereupon, He stands before the world as, in the most literal sense, the *Saviour* of the race.

(3) That as the representative of a *new type* of man (Spiritual Man), and as the inaugurator of a *new order* of human development (spiritual, as opposed to natural), He further constitutes a true "*emergence*" in cosmic development.

(4) That like every other emergence that has occurred in the past, He is necessarily the manifestation of a power "*from above*" or transcendental to the development into which he descends, and becomes incarnate.

(5) That, as in the case of other emergences, His birth was necessarily a *parthenogenetic* birth, because the result of a quickening of the germ plasm of the existing development (the germ plasm of humanity), by a power "from above" or transcendental thereto (*i. e.* "the Power from on High").

(6) That since this "Power from on High" was not only declared by Christ in His "teaching" to be "the Spirit of God," but was and is experienced by all men who have "felt" its quickening and uplifting influence as, in its very nature, a Divine Power, Christ's manifestation of it to the world in his own life, is synonymous with His being for us a genuine "manifestation of God in human flesh"—in short, a genuine *Incarnation of Deity;* and, finally,—

(7) That since such "incarnation" involves the union of both the Divine and the human in Christ He is seen to be, in very truth, what Christianity has always proclaimed Him, the *God-Man.*

We have now completed our brief discussion of the Incarnation, and in bringing our thesis to a close, it only remains for us to point out once again the complete agreement between the three lines of argument reviewed in the preceding pages.

Whether we look at the problem from the standpoint of the Cosmic Evolutionist, the psychologist, or the theologian, the conclusion is the same—the ultimate embodiment or "incarnation" of the "World-Reason," the Absolute Personality, the Christ or "God-Man" is seen to be the "one far-off, divine event to which the whole creation moves."

We may conclude, then, by summing up the entire matter in these words of America's greatest theologian:—

"If Jesus Christ is the Logos of man, then is He the Logos of all creation—of what we should now call, all Evolution—of which man is final cause and crown. And if He is the Logos of these, then He is Logos of God Himself."*

"If Jesus Christ is the divine reason of man, then He is the Divine Reason of all, and then He is personal God in all to us."§

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*Dr. W. P. DuBose, *The Reason of Life,* pp. 253.
§*Id.* p. 254.

"Man, as He is, Adam, has been the goal of the natural creation—man as he is to be, Christ, is the goal of the spiritual creation. The spiritual destination, then, of man, which is also the natural destination of the Cosmos—the end and final cause of the whole creation—is the full significance of the Incarnation."*

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*Dr. W. P. DuBose—*Soteriology*, p. 123.

CHAPTER XVI

Science and the Resurrection

IT was pointed out in our discussion of the mathematics of development (Chap. V.) that the specific "form" of every development is predetermined by the arrangement or "system" of potentials resident in its integral. Every integral consists of a number of "potentials" (potential energies) which stand in definite, orderly "ratios" one with another, and it is this complex system of ratios which determines the order of actualization, both in space and time, of all the potentials resident in the integral, or, what is the same thing, determines the precise "form" or character of the material development. Ordinarily we speak of this fundamental system of ratios as the *differential coefficient,* but since it is a system of ratios—(*i. e.* a "*rational*" or "*rational*" system) we prefer, for obvious philosophical reasons, to speak of it as the "Logos" of the development. We know, for example, that an integral whose potentials are arranged in the particular "ratio" of $\frac{dy}{dx}=2x$ will actualize or "evolve" the figure which we call a square; another which has its potentials arranged in the "ratio" $\frac{dy}{dx}=1/5x$ will actualize or "evolve" a particular form of curve (*i. e.* a curve having a specific "slope"), and that, in general, every species of curve, or other geometrical development, is pre-determined by its own specific system of ratios. But while these facts are well known, their precise philosophical significance is by no means so generally understood. It is of fundamental importance to observe, at the very outset, however, that these "predetermining ratios" are not ratios between *actualities* but between *potentialities;* that is to say they are not ratios existing between any *actual* *parts* or physical differentiations of the material development itself (however infinitesimally minute such actualities may be assumed to be), but ratios existing between the *zeros or potentials* latent in the pre-existent *immaterial integral* of the development. In short, what is of essential importance for us to recognize is the fact that the actual, material development arises out of an *im*-material integral, and every particular "actualization" or "differentiation" of the material substance of the development, is PRE-DETERMINED (both in time and space) by the character of the "ratios" subsisting between the potentials or zeros resident in this IM-MATERIAL INTEGRAL, which last, as necessarily, *antedates* its material product, the development—existing before and independently thereof.

Now what is true of these mathematical developments is true also of organic developments. Each and every organic development is likewise predetermined as to its "form" or character by the "ratios" existing between the "potentials" resident in its immaterial integral, and *not by the "ratios" or "relations" existing between any subsequently actualized particles or material "increments" of the development itself* (a self-evident absurdity), however ultra-microscopic or infinitesimally small these protoplasmic "micromeres," ("genes," or what not) may be conceived to be. Remembering, therefore, that what we call the soul is simply that immaterial integral of potential energies ("potentials") out of which the organic development which we term the material body arises, it is obvious that, like the integral of every mathematical development, it must *antedate* (and so exist *independently* of) the entire bodily development whose "matter" and structural organization it brings into being. If this truth be admitted, its implications regarding the immortality of the soul are obvious. As Joseph Cook pertinently remarked many years ago—"Huxley . . . says that life is the cause of organization, and not organization the cause of life. He has printed that opinion over and over (Huxley, *Introduction to the Classification of Animals*), and never taken it back. Well, if life is the cause of organization, probably it is safe to say the cause must exist before the effect. At least, that is Nature's logic. *But, if life may exist before organization, WHY NOT*

AFTER IT?"* The cogency of this argument is beyond question, but it becomes even more convincing when it is remembered that not only is life the cause of the structural organization of protoplasmic material (as attested by Lamarck, Spencer, Huxley, Cope, and others), but the *cause or creator of this protoplasmic substance itself*—the very agent which itself manufactures this basic material out of non-living chemical and physical energies, and which must, therefore, exist *prior to,* and *independently of*—not merely organized structure—but even *that very material out of which such structure is fashioned—viz: the protoplasm itself.* We have already shown at length that this fact is demonstrable—that whereas we have no evidence whatever of physical and chemical forces uniting (of themselves) to form protoplasm, we have direct and certain evidence of already existent life manufacturing this substance out of these non-living forces and material. The living plant is daily performing this miracle before our eyes. The life, already existent in the green leaves, is constantly integrating CO_2, H_2O, NH_3, and sunlight energy into new protoplasm every day of the world. We repeat, therefore, not only is life *the cause of the organization* of protoplasmic material, but *the cause of that material itself.* Life first manufactures the protoplasm out of non-living physical and chemical forces, and then proceeds to arrange or organize this raw material into cells, cell-layers, tissues, and organs. Add now to all this biological evidence, the mathematical evidence just adduced, and it will readily be seen that the argument for the pre-existence, as well as for the immortality of the soul—*i. e.* its independence of that "fleshly tabernacle" of which it is itself both creator and architect—becomes practically a demonstration. We mean by this that the argument for the truth of this proposition rests upon the same kind of evidence that science adduces for the existence of many other "unseen" entities, whose existence she regards as certain. It is the shallowest kind of captious criticism that balks at the existence of the soul or of God, while assuming as axiomatic the reality of numberless other alleged entities, equally as far beyond the sphere of sense-perception. It is true that no man has

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**Boston Monday Lectures*, p. 90.

ever "seen" this soul whose existence we assert and many of whose essential characteristics we claim to know; but, for that matter, no man has ever "seen" a molecule, an atom, an electron, or numberless other alleged entities whose existence and essential characteristics science claims to have demonstrated. Yet precisely the same kind of reasoning that justifies belief in the one order of "invisible realities" justifies belief in the other. All that science does is to reason from the known to the unknown, from the seen to the unseen, by strictly logical processes. Knowing that the material universe is but a net-work of phenomena all related *inter se* under the supreme formula of all relation—(*i. e. Reason per se*)—and all the processes going on amongst these phenomena obedient to "*Law*" (*i. e. a rational formula*), science simply applies the processes of reason to anticipate entities and events not immediately within the range of actual experience. In doing this, she frequently (though not always) employs that supreme instrument of symbolic logic known as mathematics. The advantage of this particular instrument consists in the fact that it can deal not only with all quantitative phenomena and their inter-relations, but can also deal with the unseen *Limits* of all quantitative actuality —zero and infinity (o and ∞)—demonstrating not only the *reality* of these limits, but even (through the methods of the integral and differential calculus) revealing many of the essential characteristics of these "unseen entities." Many of the most remarkable discoveries of modern science have been made by means of this infallible instrument, and all that we are endeavoring to point out here is the fact that the reality of such unseen entities as the soul and God can also be demonstrated and their more important characteristics be revealed, in precisely the same manner and by means of exactly the same instrument. But leaving these general considerations of the matter for the present, let us now address ourselves to a more detailed examination of some of the biological aspects of the problem.

"Older scientists," says Prof. Haeckel, "were possessed with the idea that the complete body, with all its parts, was already contained in the ovum of animals, only it was so minute and transparent that it could not be detected; that, therefore, the whole development was nothing more than a growth, or an "unfolding," of the parts that were already "infolded" (*involutae*). This erroneous notion, almost universally accepted until the beginning of the present century, is called the "*Preformation Theory*"; sometimes it is called the "*Evolution Theory*" (in the literal sense of "unfolding") but the latter title is accepted by modern scientists for the very different theory of "*Transformation*". Closely connected with the Preformation theory, and as a logical consequence of it, there arose in the last century a further theory which keenly interested all thoughtful biologists —the curious "*Theory of Scatulation.*" As it was thought that the outline of the entire organism with all its parts, was present in the egg, the ovary of the embryo had to be supposed to contain the ova of the following generation; these again, the ova of the next, and so on *in infinitum.* On that basis the distinguished physiologist Haller calculated that God had created together 6000 years ago—on the sixth day of His creatorial labors—the germs of 200,000,000,000 men, and ingeniously packed them all in the ovary of our venerable mother Eve. Even the gifted philosopher Leibnitz fully accepted this conclusion, and embodied it in his Monadist theory; and as, on his theory, soul and body are in eternal, inseparable companionship, the consequence had to be accepted for the soul; "the souls of men have existed in organized bodies in their ancestors from Adam downward—that is from the very beginning of things." In the month of November, 1759, a young doctor of twenty-six years, Caspar Friedrich Wolff (son of a Berlin tailor) published his dissertation for the degree at Halle, under the title, *Theoria Generationis.* Supported by a series of most laborious and painstaking observations, he proved the entire falsity of the dominant theories of preformation and scatulation. In the egg there is at first no trace of the coming chick and its organs; instead of it we find on top of the yolk a small, circular, white disk. This thin, "germinal disk" becomes gradually round, and then breaks up into four folds, lying upon each other, which are the rudiments of the four chief systems of organs—the nervous system above, the muscular system underneath, the vascular system (with the heart), and finally, the alimentary canal. Thus, as Wolff justly remarked, the embryonic development does not consist in an unfolding of the preformed organs, but in a series of *new constructions;* it is a true *epigenesis.* One part arises after another, and all make their appearance in a simple form, which is very different from the later structure. This only appears after a series of most remarkable formations."* Now we have already pointed out that the mathematical evidence pertaining to the problem of "origin"—the problem which lies at the bottom of every development, whether mathematical or organic—also demonstrates the fact that every such development must, of necessity, originate from an integral which exists antecedently to the entire development—which is in no sense a part thereof, and is, in fact, altogether different in kind therefrom. We have also seen that each term of the development —(each "new material construction") is but the actualization of a "potential" latent in this integral, and the order of appearance, both in time and space, of all these actualizations (whence the entire "form" or "structure" of the development) predetermined by the "ratios" or "relations" subsisting between these "potentials" already existent in the immaterial integral. Not only then are we compelled, both from mathematical and biological considerations, to assume that the real *cause* or *origin* of the development of each individual organism is an immaterial, potent or dynamic reality—a meta-physical entity lying below the physical actualities or phenomena which it brings into existence, but the whole course of the subsequent development of this physical product—the evidently pre-ordained regularity of its phenomenal sequences—can find no reasonable explanation apart from such a view. Nothing is plainer to the embryologist of to-day than that *all* the parts of an organism (cells, cell-layers, tissues, and organs) originate separately and independently from unformed material (*anlage*) and do not even attain to their characteristic forms until after a long series of transformations has been undergone, so that it can be truly said that *not a vestige of the mature organism is to be found in the original germ.* In a word, the primordial drop of protoplasm first differentiates into a number of cells, these cells are arranged into layers (two only in Acoelomata, three in Coelo-

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**The Riddle of the Universe*, pp. 54-56.

mata), and these again, are further developed or differentiated into diverse tissues and organs. That is to say, out of precisely the same material, the most diversified structures are fashioned —the same protoplasmic material, after being differentiated into a cluster of cells, is, in one instance, laid off into two, in another, into three layers without any indication as to what the ultimate result is to be; and a little later the two-layered aggregation may be diversified into the characteristic form and structure of a sponge, or the far different form and structure characteristic of a coelenterate; while, in the same way, of two specimens of three-layered anlage, one may subsequently be modelled into the structure and peculiar organs of a fish, the other into those peculiar to a man. It is just as though an artisan, out of the same clay-bank were first of all to model a quantity of bricks; then, taking some of these, he were to arrange them into certain lines and groups here, while over there, he would arrange others again (of the same kind) according to a totally different plan. Even after this, again, there might be no indication as to what he intended to build out of these dissimilar foundations. Day after day, however, if we continued to watch the process closely, we would find the arrangement of the bricks in the one instance to become more and more unique and diverse from that of the other, until finally—though, perhaps, not until very near the end of the process, we would discover the meaning of each—a private dwelling in the one case, a cathedral in the other. When completed the two are, of course, very distinct, yet both were moulded out of precisely the same material (clay), taken out of precisely the same bank. The final differences in the two buildings had nothing whatever to do with any physical differences in the original clay, or even the individual bricks. Note well—neither the residence nor the cathedral—nay, not one single pillar, arch, chimney, wall, or other portion of these complicated structures pre-existed in the original material. Yet, if we applied the view of the Preformationist here, we would have to assume that both the residence and the cathedral pre-existed, completely formed, in the original clay-bank. In a word, then, not a single characteristic organ, part or tissue of the mature organism is to be found in the germ, *nor is there any physical mark* *or feature of the original protoplasm, already pre-determined and pre-formed, which controls or directs the successive order of changes to one end rather than to another.* True, within broad limits, one might possibly risk a guess from the number of the chromosomes in the original cell what species of animal is undergoing development* but only in the same general way that one may also tell from the number of cell-layers whether the animal belongs to the Coelomata or the Acoelomata. But this amounts to nothing, so far as the argument is concerned unless one can *fore*-tell whether two layers or three layers are to be formed, or is able to forecast the number of chromosomes, etc. After certain structures are formed, it is, of course, an easy matter to predict broadly the goal toward which the development is tending, but the problem is to tell *beforehand* what these structures are going to be. The whole point of the argument is that the controlling principle of the development precedes the appearance of each and every physical structure thereof— that the *entity* which determines the physical development *pre-exists* and *pre-determines* the appearance of each and every portion of physical structure. Of course, as the development proceeds, the progressive actualization of one phenomenon after another, more and more indicates what pathway is being selected, and so the particular phylum, class, order, *etc.*, are more and more disclosed, but the point to be observed is that there is nothing in the orginal protoplasm—no physical unit of any description—that determines beforehand which pathway is going to be selected. Genes and chromosomes are no more primordial, pre-existent features of the development than are cell-layers. They are not *causes* or *determinants* of the developmental process, but *products, results, creations* thereof. Moreover, there is not a shred of evidence to show that there are any other physical "formations" of any description in the primordial protoplasm that determine either the number of the chromosomes or the number of cell-layers—no physical unit of any description that determines that there shall be 24 rather than 16 or 12 chromosomes—three cell layers rather than two; and only a little careful reflection on what has already been said about the subject of *causality* in general should assure any one that this is necessarily so, inasmuch as the supposition that any physical or material unit can be a *cause* is in itself absurd. Matter itself is the "formed," not the "enforming" principle, and so all material or physical bodies of whatever description, are "formations"—*i. e.* products of the "enforming" power or cause, and not that cause itself.

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*Even here no certain conclusions are possible, for very diverse forms often have the same number of chromosomes. Thus man, the bat and the hedgehog appear to agree in having the same number of chromosomes. It may be remarked, however, that authorities differ widely in their estimates of the number of chromosomes in different species.

But if that which *originates* the body of every material organism—that is to say, if that which both originates (creates) the *matter* of the body itself, and further determines the precise "form" and character of the succession of developmental changes or transformations which that matter must undergo in the course of its development, as well as the final *form* or *type* which it must attain—if that which determines all this be the *im-material integral of potential energies* which we call the *soul*—an entity altogether distinct from this material, bodily development which arises from it (because the mathematical *origin* of this development), it is obvious that *this immaterial soul exists prior to, and independently of, this bodily development which it so originates and fashions; and that the body must therefore depend upon the soul for existence, not the soul upon the body.* In short, since the soul, as the origin of the material body, necessarily existed before the body's formation, and independently of the latter's existence, so it can continue to exist after the destruction of the body. As Joseph Cook expressed it, "If life may exist before organization, it may do so after it, or outside it." The soul not being a *term* of the developmental series, is, of course, not destroyed with the destruction of that series. The body then depends upon the soul, not the soul upon the body. The latter is simply the *product* of the soul's energy cooperating with other external, or environing energies. With any unusual change in the relation of these primary factors (the energy of the soul and the energies of the environment) there must, of necessity, be a change in the structural condition of this *product* of their inter-action; and if, for any reason cooperation ceases altogether, the body must immediately cease to exist, but this does not by any means imply the destruction of either of the *primary creative energies.* In a word, the destruction of the body, under such conditions, no more implies the destruction of the *soul* than it does the destruction of the *environment.* The energy of the soul simply ceases to be kinetic or actual in this particular relation—*i. e.* it is reduced to *potentiality* (energy never being annihilated *per se*), and there is absolutely no inherent reason why, under such circumstances, when the body is destroyed at death, the soul should not continue to exist, and with the return of suitable environing conditions, *re-produce or re-create another body of precisely the same plan or pattern as the former,* in very much the same manner in which the trees which lose their leaves under the destroying influences of winter, with the return of suitable conditions in the spring put forth their leaves anew, always re-creating them, however, according to the former, characteristic type or pattern—the oak invariably re-producing oak leaves, the maple, maple leaves, *etc.* We might even press the analogy further. We might liken the death and resurrection of the human body to the death and resurrection of the bodies of our perennial plants. In the winter, the body of the plant is "killed down to the very roots," as we commonly (though somewhat incorrectly) observe. Yet with the return of the warmth and moisture of the balmy spring days, the "soul" of the plant (*i. e.* the life-energy that has been static or potential all the winter) is roused once more out of its sleep into activity—the potential energy stored away in the protoplasm of the underground stem is suddenly liberated, and immediately begins the re-construction of its characteristic bodily form. The soul of each plant builds for itself a new body, fashioning it, in every instance, *according to its own peculiar design—i. e.* in accordance with its own logos. Be it observed, it is this permanence of *type* or *pattern —this persistence of the logos*—that constitutes the *identity* of the individual, and so insures our *recognition* of it. It is this principle, for example, that enables us to affirm that a particular Dahlia that we are now looking at is the *same* Dahlia that was growing on that spot last year. The *material* of the body has indeed changed—in fact it was totally destroyed by the winter's ice and snow—but the *form* continues the same. The same integral with its characteristic logos lives on and manifests itself anew in this present body; so that we unhesitatingly assert that it is the *same* Dahlia. In precisely the same manner, we are given to understand that in the resurrection, though clothed in different bodies, we shall be *recognizably the same individuals.* Nor is there anything so mysterious in this statement, for even in this present life, because of the inexorable law of metabolism, our bodies are constantly changing—a complete transmutation of *matter* every few years—so that a man who attains to three-score years and ten, has actually changed his body many times in that period. Yet, nevertheless, despite this metamorphosis of the actual material his friends continue to recognize him as the same individual.

But to return to our illustration of the Dahlia.

It is not, of course, pretended here that this is an actual instance of a resurrection on the same scale as that which we have under consideration, as the entire body of the plant is not destroyed—a given quantity of protoplasmic matter being preserved in the underground stem—but it is nevertheless much more than a mere suggestion of the process under discussion—it is, indeed, a genuine illustration of the same principle, though its manifestation here is but partial, and the process exemplified on a minor scale. Thus, while, in this instance, the protoplasm of the underground stem constitutes a material embodiment of the soul or life-energy, it is not that particular material embodiment with which we are familiar, and by which we recognize the plant. That body has been completely destroyed. There is not, in this underground mass of protoplasm a single organic structure of that body. There is not a single tissue or organ characteristic of that well known body to be found there. In short, the body that we knew—that body with its characteristic vine-like stem, branches, leaves, flowers, fruit, *etc.*, or its more subordinate structures, petals, sepals, pistils, stamens, *etc.,—has been entirely destroyed* by the frosts of winter—has fallen to the ground and rotted in the earth, and yet from out of what is in this sense a truly "bodiless" mass of matter, the latent life-energy or soul has *re-produced or re-constructed a body of precisely the same kind or type as the former—with precisely the same pattern of stem, branches, leaves, flowers, fruit, etc.*, thus proving beyond all question that there is a *logos* or *directive rational principle* within and characteristic of the life-energy itself which is capable of taking what might be termed the raw material of such "bodiless" protoplasm and moulding or fashioning it according to an ideal Type or Pattern of its own—capable of creating a kind of body which does not exist at all save as an *"idea," or logos, potential in the immaterial integral of the development*, for be it remembered *this* body (of which we are now speaking) does not even exist in the protoplasm of the underground cell. Now true death and resurrection is precisely the same process carried further—that is to say up to its *material* rather than its *"structural" limit.* In this latter instance, the destruction of the material embodiment is not partial, but total—it does not stop with the annihilation merely of the visible or gross body of the organism, but involves the fundamental protoplasmic material as well—in short, covers the entire material development. But, say our opponents, here lies the very meat of the whole problem. We have no grounds for believing that such a complete or total destruction of the material development can be followed with any process of re-production or regeneration of the bodily organism. However far it may be possible to carry this principle of "regeneration," some portion (however small) of the protoplasmic material must be preserved from ultimate destruction, if any regeneration of lost parts, to say nothing of the entire bodily "structure," is to be effected. But why so? What right have we to assume that even this minimum of fundamental protoplasm is a necessary pre-requisite or condition of vital activity, when (as we have seen) every shred of evidence goes to show that *protoplasm itself is a product* (*not a condition*) *of vital activity*—*i. e.* a substance constructed by vital energy itself out of non-living H_2O, CO_2, NH_3, and sunlight, and that this creation of protoplasm by the vital principle is a process that is continually going on in the plant world before our very eyes. Not only is there abundant evidence for this in Nature, but the fact (which is persistently ignored) that protoplasm is *per se* an *organized* substance, even in its lowest terms, is proof of the principle here enunciated. Herbert Spencer pointed this out years ago. Under the caption, "Does life produce Organization, or does Organization produce life," he asserts that "on the hypothesis of Evolution, Life necessarily comes *before* organization. On this hypothesis, organic matter in a state of homogeneous aggregation must precede organic matter in a state of heterogeneous aggregation. But since the passing from a structureless state to a structured state, is itself a vital process, it follows that *vital activity must have existed while there was yet no structure*: *structure could not else arise.* That function takes precedence of structure, seems also implied in the definition of Life . . . Function is from beginning to end the determining cause of structure."* To the same effect is the statement of Cope that both consciousness and life have "preceded organism".§ It is true, of course, that when making the above statement, Herbert Spencer was primarily concerned with the origination of the many-celled, tissue structure, out of the relatively "homogeneous" protoplasm (*i. e.* a substance devoid of such structures as cells, tissues, organs); but the fact remains that the principle which he was endeavoring to bring out, viz: that *life produces organization, and* NOT *the reverse*—goes beyond this, and is just as applicable to the origination of the organized substance of the protoplasm itself, out of the un-organized chemical and physical energies. Protoplasm itself is *organized* matter, and this very organization of protoplasm is again the *product* of life activity. Nor do we rest the argument merely upon the evidence presented to the biologist. That which clinches the whole question, and sets at rest all speculation, is (as we have seen) the argument presented by mathematics, and which demonstrates with absolute certitude that there can be no *origin* of any developmental movement, short of the *integral* of the development itself—a fact which is simply self-evident; and as the integral is never a "*term*" of the development, but the necessary antecedent condition of all its "Terms," it is obvious that the *origin* or cause exists *before* there is or can be, any development— *i. e. before the very first term is, or can be, actualized.** If, then, we see the partial death or destruction of bodily organisms exhibited in all possible degrees, from a slight wearing away of tissue, through the loss of various parts and organs, down to complete annihilation of the entire multicellular structure; and if, following this more or less complete dissolution, we behold an invisible architect not only re-building this entire multicellular fabric in strict conformity to the original plan or ideal, but even creating anew the necessary raw material (protoplasm) out of which this higher body (cells, tissues, organs) is to be progressively constructed—how is it possible to avoid the conclusion that this invisible architect exists independently of, and prior to, this entire body he produces? At what point *in* this development is it possible to place the *source* or *origin* of this mysterious Power which is necessary to the actualization of every term thereof? Is there *any* last phenomenal stage or "term" in the series of phenomenal transformations that we speak of as the development *beyond* which this re-constructive energy cannot be found? If all matter is, *per se,* heterogeneous, and if all heterogeneity is the *product* of differentiation (*i. e. development*) from a more homogeneous state, how can there be any primordial *un*-derived heterogeneity—that is any matter that has not itself been "evolved"? The Power, then, that "originates" any material development—simply because it is the "origin" or "originating entity"—is not any "term" in the development, but its *immaterial Integral.* The source of the developing energy will not be discovered in any physical micromere whatever, therefore, but only in the *meta*-physical, matter-creating Entity which lies beyond all matter and material structure whatever. But if this be true, it also follows that the annihilation of the entire material development can have no effect whatever either upon the existence or upon the character of this Trans-

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*Principles of Biology, Vol. I., p. 153; p 167.

§Primary Factors of Organic Evolution, p. 513.

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*In short, the origin of a natural development "*is less than any assignable quantity*" of matter—hence *beyond* matter itself, in an *Immaterial* Integral.

cendent Reality; and because it has once (under certain environmental conditions) produced such a material development, it can upon the occasion of the destruction of such development, and with the return of similar environmental conditions, reproduce the same again, not merely in part but in its entireness. We conclude, then, that *an immaterial, self-directing principle* lying beyond and independent of matter is the only assumption that is possible. In a word, we come back to Harvey's dictum that life is itself a "formative principle"; an energy possessed of the unique power of acting according to a fixed (rational) formula which is inherent in its own nature—its very "character," "individuality" or *logos;* and that in doing so, it merely utilizes the forces and opportunities furnished by the environment to construct a material habitation for itself after the "pattern" or "ideal" of this its logos. This, too, is involved in Cope's theory of *Archaesthetism,* which we fully endorse, *viz:* that all bodily structure and organization is the product of the activity of the *conscious life-energy,* and that when we reduce the problem to its lowest terms, we are driven irresistibly to the conclusion that life must have "preceded organism in time and evolution"—that it (life) "has been the *primum mobile* in the creation of organic structure." In other words, we are driven to the conclusion that the life-principle *existed before* its material embodiment, and that that embodiment is itself—both as respects its "matter" proper, and its "form," structure" or "organization"—the *product* or *creation* of vital activity. That instead of matter fixing the "form" of energy, it is energy (by its own inherent law of activity) which gives being and form to matter.

If then, this hypothesis is to be trusted—and be it remembered, it rests upon the surest conclusions of metaphysics, biology, and mathematics—its bearing upon the problem of the immortality of the soul and the probable resurrection of the body is too obvious for further comment. If this soul or life-energy existed *before* the body and its organization, and so *independently* thereof, it is clear that the destruction of the body can in no wise affect its integrity—but it must continue to exist after death and preserve its individuality, and—with the return of suitable conditions—produce its characteristic body once again.

Before bringing this chapter to a close, a word or two must be said with regard to a certain objection which will doubtless be raised by the orthodox churchman. It will be urged that such a view eliminates, if it does not actually contradict, the whole teaching of Christianity that salvation into life eternal can only be attained through the recognition of a certain relation of the soul to Jesus Christ. It renders the redemptive work of Christ entirely superfluous. If a man is, as it were, naturally immortal, and shall continue, merely by virtue of his own soul-nature, to exist after death, where does the work of Christ as the *Saviour* of the soul, come in? This objection, however, is easily answered, as it is founded upon a very patent, even though common, misunderstanding of the statements of Holy Writ. That man is "naturally" immortal, whether obedient to Christ or not, is a clear teaching of Holy Scripture itself. Indeed, if the wicked and disobedient were not immortal, there would be no point in the doctrine of a state of self-determined misery after death. That there is to be a "resurrection of the dead, both of the just and unjust" is emphatically asserted both in Acts xxiv. 15; John v. 28-30; and elsewhere. What is meant by salvation in Christ and in Christ *exclusively*, is something very different from the soul's mere survival of death. Christ's work consists not in insuring the soul a mere existence after death (for that is already "naturally" assured) but insuring for it a life of *eternal progress and development* after death, which means again a life of eternal happiness rather than eternal misery. The Scriptures assert that although all men shall exist after death, only those who accept the "revelation" of Christ can expect to exist in a state of progress, well-being and eternal development, and this because the "vision" He has given us is (in the very nature of things) the only one that can "motivate" the will forever upwards and onwards through eternity. Those who ignore the "revelation" though they shall continue to exist after death, must do so in a state of arrested development, experiencing all the misery and unhappiness which such a state necessarily entails. In other words, it must not be forgotten that here, even as in the animal world, it is not every organism that is "selected" for participation in the higher progressive life to which the entire cosmic development is tending, but only those who meet the demands of the changing environment, and so prove themselves fit to survive. The only difference between human and animal evolution in this particular is that the latter have no individual choice in the matter, whereas in the human sphere, the individual, as a voluntary agent, can always exercise such choice, and all who do in fact choose to submit to these "demands," or "heed the Call," are themselves in turn, always "chosen" ("selected" or "elected") to participate in the coming life and its blessings. What these conditions are, has been abundantly set forth in former chapters. Briefly stated, they may be said to be *altruistic* and *spiritual*, as opposed to *individualistic* and *natural* (*i. e.* physical). They are conditions involving the complete surrender of selfish ends and personal interests, and the incorporation of the individual into the "body" of a social unity (the church) which, though outwardly nothing more than a mere society ("organization") of men and women, is, in point of fact, not an "organization," but an *organism*—a perfect whole; in which social organism, as it might truly be called, every "member" is absolutely controlled by a *supreme spirit*, Who is none other than the *Divine Love Himself*—the "embodied," that is "incarnate" *Spirit of the Cosmos*. In a word, all future "development"—that is, real progress in a higher kind of life and happiness, according to the revelation given us, will be possible only under these "social-organic" conditions. Men who do not enter into these relations voluntarily—are not motivated by this Ideal—hence who do not become "members incorporate in the Mystical Body of Christ," will certainly continue to exist; but mere existence must not be confounded with *progress* or *development*, or with the experience of well-being and happiness. On the contrary, the state of well-being, health, happiness is one which is only experienced when an organism is growing or developing normally in the free fulfilment of its "law"; and whenever anything occurs to obstruct or interfere with this normal progress—that is to arrest the development—the experience of *dis*-ease, *dis*-

comfort, unhappiness inevitably results. It will be readily seen, therefore, that only those who enter voluntarily into those "socio-organic" relations upon which all progress into a higher state of development depends—only those, in other words, who become "members" of the "Mystical Body" and assume its obligations—only they can experience that unending progress in well-being and happiness, which is spoken of as "eternal life in Christ"—"Heaven", *etc.;* while those who refuse to submit to the conditions, must expect to enter upon a no less eternal state of existence, but which is, as necessarily, deprived of the joys and happiness of the other—an eternal state of disappointment and unhappiness. It will thus be seen that the conditions of "Salvation" well-being, happiness, hereafter, are indissolubly associated with Christ and His Church, that indeed,—"there is none other name under heaven given among men, whereby we must be saved." (Acts IV. 12.)

Summary of Argument

I.

Cosmic development is an alternating series of CREATIONS and (consequent) EVOLUTIONS, which beginning with *matter* leads upward through the successive "Emergences" of *life, mind,* and *spirit,* to *God*—the source from which it originated—that *integral* out of which the whole development proceeds, and which, therefore, contains the potentials of all its actualizations—the Final Cause to which it all returns—the *alpha* and *omega* of the cosmic cycle.

Because of the chronological sequence of these emergences, the cosmic process appears superficially as a continuous, uninterrupted Evolution out of matter—life, mind, spirit, and even God Himself appearing to be but so many actualizations of the potentials inherent in this primordial integral.

Careful examination, however, reveals the fact that the chronological sequence is the very *reverse* of the logical sequence—that here, as in the astronomical sphere, the apparent motion is the very antithesis of the real motion;—that *GOD*, and not matter, is the Integral-Center of the universe.

This view, then,—(which may be appropriately termed the Heliocentric as opposed to the older Geocentric theory of the universe)*—while it denies that the cosmic process can be explained as an evolution or progressive "unfolding" (actualization) of the potentials latent in *matter;* does, nevertheless, maintain that it is a true evolution or progressive unfolding (actualization) of the potentials inherent in the *Divine Mind, i. e. God.*

This means that the same process which when viewed from the standpoint of matter is known (in spite of appearances to the contrary) to be a broken or dis-continuous process (*i. e.* an alternating series of creations and consequent evolutions independently inaugurated): when looked at from the standpoint of *God*—the Final Cause—is seen to be *a continuous evolution or progressive "unfolding" of the potentials resident in this Divine Integral.*

In short, cosmic development may be regarded as the progressive actualization of the potentials resident in the Integral of the universe —the order of the appearance of these actualizations, both in space and time, being determined by the "Logos" (*i. e.* the system of "ratios" subsisting between the potentials therein—hence the "rational system") of this Integral of the universe, which is again, the *Logos or reason of God.* It will be obvious, therefore, that the completion of cosmic development, being synonymous with the actualization or embodiment of all the potentials of the Cosmic Integral in accordance with the "form" of its determining Logos, is synonymous with the complete embodiment of this Cosmic Logos—that is, synonymous with the "Incarnation" of the *Divine Logos—the Reason of the universe.*

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*I am indebted to my Father—Prof. John McCrady—for this astronomical illustration of the principle.

II.

In conclusion, we may say that this view is in line with that conception of Development which was entertained by Aristotle. As is well known, the "Ideas" of Plato were with Aristotle the "Forms" or (as we would say) "Limits" toward which matter developed—matter being the *potentiality* or *possibility* whose ideal actualization was represented by the "form". Now, in Aristotle's view, cosmic development as a whole was an unbroken chain of subordinate developments (i. e. a series of developments linked one to another)—the form or limit of one development, *A*, being the matter or potentiality of the next, *B*, and the form or limit of *B* being, in turn, the matter or potentiality of *C*; *etc.* Moreover, in applying this principle, he specifically recognized three orders of "souls"—the "*vegetative*" (corresponding to what we have designated the "aneuronic"); the "*appetitive*" or animal (corresponding to what we have designated the "neuronic"); and the "*rational*" or distinctively human (corresponding to what we have called the "phronetic"); and these three were so related that the appetitive or animal soul was the form of the vegetative, and simultaneously, the matter of the rational or human soul. As a consequence of this principle, nothing could be regarded as lost in Nature, for the actualizations of any given development, *A*, were (upon the completion of that development) potentialized in the Integral of the next development, *B*, and the actualizations of this development, in turn, potentialized in the Integral of the next higher, *C*, and so on. Not only, therefore, did the animal soul contain the "potentials" of the vegetative, but the potentials of both of these, were again taken up into the human soul, so that man was, as it were, a microcosm. But even this is not all. While not so clearly stated, perhaps, yet it is well known that Aristotle conceived his "forms" not only as existing *prior* to, but as even being the *teleological causes*, of the developments leading up to them, so that, as a matter of fact, the logical order of events was precisely the reverse of the apparent order of Nature. In short, with Aristotle, the END of any given development was, in reality, its logical *origin* or *beginning*—

the *form* or *ideal goal* to which it tended was, in reality, the already existent *final cause* or *originating power* of the whole movement, and as in the case of the universal or cosmic development this ultimate Form was conceived to be the DIVINE NOUS or REASON, it will be seen that Aristotle likewise looked forward to this ideal Incarnation of the Divine Logos as the consummation of the entire movement.

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